CHAPTER 71

POWER PLANT

LIST OF EFFECTIVE PAGES

N, R or D indicates pages which are New, Revised or Deleted respectively.

Remove and insert the affected pages and complete the Record of Revisions and the Record of Temporary Revisions as necessary.

CHAPTER 71

POWER PLANT

LIST OF EFFECTIVE PAGES

N, R or D indicates pages which are New, Revised or Deleted respectively.

Remove and insert the affected pages and complete the Record of Revisions and the Record of Temporary Revisions as necessary.

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
S.B. LIST		1	May 30/78	T. of C.		19	Mar 31/00
S.B. LIST		2	May 30/79	T. of C.		20	Mar 31/00
S.B. LIST		3	May 30/79	T. of C.		21	Mar 31/00
S.B. LIST		4	Mar 31/99	T. of C.		22	Mar 31/00
S.B. LIST		4 A	Mar 31/99	T. of C.		23	Mar 31/00
S.B. LIST		4 B	Mar 28/02	T. of C.		24	Mar 31/00
S.B. LIST		5	Mar 31/99	T. of C.		25	Mar 31/00
S.B. LIST		6	Nov 30/80	T. of C.		26	Mar 31/00
S.B. LIST		7	Aug 30/80				
S.B. LIST		8	Aug 30/80	71-00-00		1	Mar 28/02
S.B. LIST		9	Aug 30/80	71-00-00		2	May 30/76
S.B. LIST		10	Aug 30/80	71-00-00		3	May 30/79
S.B. LIST		11	Aug 30/80	71-00-00		4	May 30/79
S.B. LIST		12	Aug 30/80	71-00-00		5	May 30/76
S.B. LIST		13	Nov 30/81	71-00-00		6	Mar 28/02
S.B. LIST		14	Nov 30/81	71-00-00		7	May 30/76
S.B. LIST		15	Nov 30/81	71-00-00		8	Mar 28/02
S.B. LIST		16	Mar 31/98	71-00-00		9	Mar 28/02
S.B. LIST		17	Mar 31/98	71-00-00		10	May 30/76
				71-00-00		11	Mar 28/02
T. of C.		1	Mar 28/02	71-00-00		12	May 30/76
T. of C.		2	Mar 31/00	71-00-00		13	May 30/76
T. of C.		3	Mar 31/00	71-00-00		14	Mar 28/02
T. of C.		4	Mar 31/00	71-00-00		15	Mar 28/02
T. of C.	R	5	May 31/03	71-00-00		16	Mar 28/02
T. of C.		6	Mar 31/00	71-00-00		17	Mar 28/02
T. of C.		7	Mar 31/00	71-00-00	R	18	May 31/03
T. of C.		8	Mar 31/00	71-00-00		19	Nov 30/76
T. of C.		9	Mar 31/00	71-00-00		20	Nov 30/76
T. of C.		10	Mar 31/00	71-00-00		21	Nov 30/76
T. of C.		11	Mar 31/00	71-00-00		22	Nov 30/76
T. of C.		12	Mar 31/00	71-00-00		23	Nov 30/76
T. of C.		13	Mar 31/00	71-00-00		24	Nov 30/76
T. of C.		14	Mar 28/02	71-00-00		25	Nov 30/76
T. of C.		15	Mar 31/00	71-00-00		26	Nov 30/76
T. of C.		16	Mar 31/00	71-00-00		27	Nov 30/76
T. of C.		17	Mar 31/00	71-00-00		28	Nov 30/76
T. of C.		18	Mar 31/00	71-00-00		29	Nov 30/76

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
71-00-00		30	Nov 30/76	71-00-00	R	78	May 31/03
71-00-00		31	May 30/82	71-00-00	R	79	May 31/03
71-00-00		32	Nov 30/76	71-00-00		80	Sep 30/86
71-00-00		33	Nov 30/76	71-00-00		81	May 30/79
71-00-00		34	Nov 30/76	71-00-00		82	May 30/79
71-00-00		35	May 30/80	71-00-00		83	May 30/79
71-00-00		36	May 30/80	71-00-00		84	May 30/79
71-00-00		37	Nov 30/76	71-00-00		85	May 30/79
71-00-00		38	Nov 30/76	71-00-00		86	May 30/79
71-00-00		39	Feb 28/79	71-00-00		87	May 30/79
71-00-00		40	Nov 30/76	71-00-00		301	Mar 30/01
71-00-00		41	Nov 30/76	71-00-00		302	Mar 30/01
71-00-00		42	Nov 30/76	71-00-00		302 A	Mar 30/01
71-00-00	R	43	May 31/03	71-00-00		302 B	Mar 30/01
71-00-00	R	44	May 31/03	71-00-00		303	Mar 30/01
71-00-00		45	Nov 30/76	71-00-00		304	Nov 30/80
71-00-00		46	Nov 30/76	71-00-00		305	Nov 30/80
71-00-00		47	Nov 30/76	71-00-00		306	Nov 30/80
71-00-00		48	Nov 30/76	71-00-00		307	Nov 30/80
71-00-00	R	49	May 31/03	71-00-00		308	Nov 30/80
71-00-00		50	Nov 30/78	71-00-00		309	Nov 30/80
71-00-00		51	Nov 30/78	71-00-00		310	Nov 30/80
71-00-00		52	Mar 31/95	71-00-00		311	Nov 30/80
71-00-00	R	53	May 31/03	71-00-00		312	Nov 30/80
71-00-00	R	54	May 31/03	71-00-00		313	Nov 30/80
71-00-00	N	54 A	May 31/03	71-00-00		314	Nov 30/80
71-00-00	N	54 B	May 31/03	71-00-00		315	Nov 30/80
71-00-00		55	Nov 30/78	71-00-00		316	Nov 30/80
71-00-00		56	Nov 30/78	71-00-00		317	Nov 30/80
71-00-00		57	Nov 30/78	71-00-00		318	Nov 30/80
71-00-00	R	58	May 31/03	71-00-00		319	Nov 30/80
71-00-00		59	Nov 30/78	71-00-00		320	Mar 30/01
71-00-00		60	Nov 30/78	71-00-00		321	Nov 30/80
71-00-00		61	Nov 30/78	71-00-00		322	Mar 30/01
71-00-00		62	Nov 30/78	71-00-00		323	Mar 30/01
71-00-00		63	Nov 30/78	71-00-00		324	Nov 30/80
71-00-00		64	Mar 31/95	71-00-00		325	Nov 30/80
71-00-00		65	Feb 28/79	71-00-00		326	Nov 30/80
71-00-00	R	66	May 31/03	71-00-00		327	Nov 30/80
71-00-00		67	May 30/79	71-00-00		328	Mar 31/99
71-00-00		68	May 30/79	71-00-00		328 A	Mar 31/99
71-00-00		69	May 30/79	71-00-00		328 B	Mar 31/99
71-00-00	R	70	May 31/03	71-00-00		329	Mar 31/99
71-00-00		71	May 30/79	71-00-00		330	Mar 31/99
71-00-00		72	May 30/79	71-00-00		331	Nov 30/80
71-00-00		73	May 30/79	71-00-00		332	Mar 31/99
71-00-00		74	May 30/79	71-00-00		333	Mar 31/99
71-00-00		75	May 30/79	71-00-00		334	Nov 30/80
71-00-00		76	May 30/79	71-00-00		335	Nov 30/80
71-00-00		77	May 30/79	71-00-00		336	Nov 30/80

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
71-00-00		337	Nov 30/80	71-00-00		447	Aug 30/80
71-00-00		401	May 30/79	71-00-00		448	Aug 30/80
71-00-00		402	Sep 30/86	71-00-00		449	Aug 30/80
71-00-00		403	Sep 30/86	71-00-00		450	Aug 30/80
71-00-00		404	Aug 30/80	71-00-00		451	Aug 30/80
71-00-00		405	Aug 30/80	71-00-00		452	Aug 30/80
71-00-00		406	Aug 30/80	71-00-00		453	Aug 30/80
71-00-00		407	Aug 30/80	71-00-00		454	Aug 30/80
71-00-00		408	Aug 30/80	71-00-00		455	Aug 30/80
71-00-00		409	Feb 28/79	71-00-00		456	Aug 30/80
71-00-00		410	Feb 28/79	71-00-00		457	Aug 30/80
71-00-00		411	Feb 28/79	71-00-00		458	Aug 30/80
71-00-00		412	Feb 28/79	71-00-00		459	Aug 30/80
71-00-00		413	Aug 30/80	71-00-00		460	Aug 30/80
71-00-00		414	Aug 30/80	71-00-00		461	Aug 30/80
71-00-00		415	Aug 30/80	71-00-00		462	Aug 30/80
71-00-00		416	May 30/79	71-00-00		463	Aug 30/80
71-00-00		417	May 30/79	71-00-00		464	Aug 30/80
71-00-00		418	Aug 30/80	71-00-00		465	Aug 30/80
71-00-00		419	Aug 30/80	71-00-00		466	Aug 30/80
71-00-00		420	Mar 31/99	71-00-00		467	Aug 30/80
71-00-00		421	Aug 30/80	71-00-00		468	Aug 30/80
71-00-00		422	Aug 30/80	71-00-00		469	Aug 30/80
71-00-00		423	Aug 30/80	71-00-00		470	Aug 30/80
71-00-00		424	Mar 31/99	71-00-00		471	Aug 30/80
71-00-00		424 A	Mar 31/99	71-00-00		472	Aug 30/80
71-00-00		424 B	Mar 31/99	71-00-00		473	Aug 30/80
71-00-00		425	Aug 30/80	71-00-00		474	Aug 30/80
71-00-00		426	Aug 30/80	71-00-00		475	Aug 30/80
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71-00-00		428	Aug 30/80	71-00-00		477	Aug 30/80
71-00-00		429	Aug 30/80	71-00-00		478	Aug 30/80
71-00-00		430	Aug 30/80	71-00-00		479	Aug 30/80
71-00-00		431	Aug 30/80	71-00-00		480	Aug 30/80
71-00-00		432	Aug 30/80	71-00-00		481	Aug 30/80
71-00-00		433	Aug 30/80	71-00-00		482	Aug 30/80
71-00-00		434	Mar 28/02	71-00-00		483	Aug 30/80
71-00-00		434 A	Nov 30/84	71-00-00		484	Aug 30/80
71-00-00		435	Nov 30/81	71-00-00		485	Aug 30/80
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71-00-00		437	Nov 30/81	71-00-00		487	Aug 30/80
71-00-00		438	Nov 30/81	71-00-00		488	Aug 30/80
71-00-00		439	Nov 30/81	71-00-00		489	Aug 30/80
71-00-00		440	Aug 30/80	71-00-00		490	Aug 30/80
71-00-00		441	Aug 30/80	71-00-00		491	Aug 30/80
71-00-00		442	Aug 30/80	71-00-00		492	Aug 30/80
71-00-00		443	Aug 30/80	71-00-00		493	Aug 30/80
71-00-00		444	Aug 30/80	71-00-00		494	Aug 30/80
71-00-00		445	Aug 30/80	71-00-00		495	Aug 30/80
71-00-00		446	Aug 30/80	71-00-00		501	Mar 31/95

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
71-00-00		502	Mar 31/95	71-00-00		548	Sep 30/92
71-00-00		503	Mar 31/95	71-00-00		549	Sep 30/92
71-00-00		504	Sep 30/92	71-00-00		550	Sep 30/92
71-00-00		505	Feb 28/81	71-00-00		551	Sep 30/92
71-00-00		506	Feb 28/81	71-00-00		552	Sep 30/91
71-00-00		507	Feb 28/81	71-00-00		553	Mar 31/00
71-00-00		508	Feb 28/81	71-00-00		554	Mar 29/96
71-00-00		509	Feb 28/81	71-00-00		555	Sep 30/92
71-00-00		510	Feb 28/81	71-00-00		556	Feb 28/81
71-00-00		511	Feb 28/81	71-00-00		557	Mar 31/99
71-00-00		512	Feb 28/81	71-00-00		558	Mar 31/99
71-00-00		513	Feb 28/81	71-00-00		558 A	Mar 31/99
71-00-00		514	Feb 28/81	71-00-00		558 B	Mar 31/00
71-00-00		515	Feb 28/81	71-00-00		558 C	Mar 31/99
71-00-00		516	Mar 28/02	71-00-00		558 D	Mar 31/99
71-00-00		517	Feb 28/81	71-00-00		558 E	Mar 31/99
71-00-00		518	Sep 30/93	71-00-00		558 F	Mar 31/99
71-00-00		519	Sep 30/91	71-00-00		559	Sep 30/93
71-00-00		520	Sep 30/91	71-00-00		560	Sep 30/93
71-00-00		521	Sep 30/91	71-00-00		561	Sep 30/93
71-00-00		522	Mar 27/97	71-00-00		562	Sep 30/93
71-00-00		523	Feb 28/81	71-00-00		563	Sep 30/92
71-00-00		524	Sep 30/87	71-00-00		564	Sep 30/92
71-00-00		525	Nov 30/83	71-00-00		565	Sep 30/92
71-00-00		526	Nov 30/83	71-00-00		565 A	Sep 30/92
71-00-00		527	Sep 30/93	71-00-00		565 B	Sep 30/92
71-00-00		528	Sep 30/93	71-00-00		566	Aug 30/81
71-00-00		529	Sep 30/93	71-00-00		567	Sep 30/93
71-00-00		530	Sep 30/93	71-00-00		568	Feb 28/81
71-00-00		531	Sep 30/93	71-00-00		569	Feb 28/81
71-00-00		532	Sep 30/93	71-00-00		570	Sep 30/86
71-00-00		533	Nov 30/83	71-00-00		571	Feb 28/81
71-00-00		534	Nov 30/85	71-00-00		572	Feb 28/81
71-00-00		534 A	Nov 30/85	71-00-00		573	Feb 28/81
71-00-00		534 B	Nov 30/84	71-00-00		574	Feb 28/81
71-00-00		534 C	Nov 30/83	71-00-00		575	Sep 30/86
71-00-00		534 D	Nov 30/83	71-00-00		576	Sep 30/86
71-00-00		535	Feb 28/81	71-00-00		577	Sep 30/93
71-00-00		536	Feb 28/81	71-00-00		578	Sep 30/93
71-00-00		537	Feb 28/81	71-00-00		579	Sep 30/93
71-00-00		538	Feb 28/81	71-00-00		580	Sep 30/93
71-00-00		539	Sep 30/93	71-00-00		581	Feb 28/81
71-00-00		540	Sep 30/93	71-00-00		582	Feb 28/81
71-00-00		541	Sep 30/93	71-00-00		583	Feb 28/81
71-00-00		542	Sep 30/93	71-00-00		584	Feb 28/81
71-00-00		543	Sep 30/93	71-00-00		585	Feb 28/81
71-00-00		544	Sep 30/92	71-00-00		586	Feb 28/81
71-00-00		545	Sep 30/92	71-00-00		587	Feb 28/81
71-00-00		546	Sep 30/92	71-00-00		588	Feb 28/81
71-00-00		547	Sep 30/92	71-00-00		589	Feb 28/81

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
71-00-00		590	Feb 28/81	71-00-00		609	Mar 28/02
71-00-00		591	Feb 28/81	71-00-00		610	Sep 30/92
71-00-00		592	Feb 28/81	71-00-00		610A	Mar 31/00
71-00-00		593	Sep 30/93	71-00-00		610B	Mar 31/00
71-00-00		594	Feb 28/81	71-00-00		610C	Mar 31/95
71-00-00		595	Feb 28/81	71-00-00		610D	Mar 31/95
71-00-00		596	Feb 28/81	71-00-00		611	Mar 31/00
71-00-00		597	Feb 28/81	71-00-00		612	Mar 31/00
71-00-00		598	Feb 28/81	71-00-00		613	Mar 31/00
71-00-00		599	Sep 30/93	71-00-00		614	Mar 31/00
71-00-00		A500	Feb 28/81	71-00-00		615	Mar 31/00
71-00-00		A501	Feb 28/81	71-00-00		616	Mar 31/00
71-00-00		A502	Feb 28/81	71-00-00		617	Mar 31/00
71-00-00		A503	Feb 28/81	71-00-00		618	Mar 31/00
71-00-00		A504	Feb 28/81	71-00-00		619	Aug 30/81
71-00-00		A505	Feb 28/81	71-00-00		620	Aug 30/81
71-00-00		A506	Feb 28/81	71-00-00		621	Mar 31/00
71-00-00		A507	Feb 28/81	71-00-00		622	Mar 31/00
71-00-00		A508	Feb 28/81	71-00-00		623	May 30/81
71-00-00		A509	Feb 28/81	71-00-00		624	May 30/81
71-00-00		A510	Feb 28/81	71-00-00		625	Mar 31/00
71-00-00		A511	Feb 28/81	71-00-00		626	Mar 31/00
71-00-00		A512	Feb 28/81	71-00-00		627	Mar 27/97
71-00-00		A513	Feb 28/81	71-00-00		628	Mar 27/97
71-00-00		A514	Feb 28/81	71-00-00		629	Mar 27/97
71-00-00		A515	Feb 28/81	71-00-00		630	Mar 27/97
71-00-00		A516	Feb 28/81	71-00-00		631	Mar 27/97
71-00-00		A517	Feb 28/81	71-00-00		632	Mar 27/97
71-00-00		A518	Feb 28/81	71-00-00		633	Mar 27/97
71-00-00		A519	Feb 28/81	71-00-00		634	Mar 27/97
71-00-00		A520	Feb 28/81	71-00-00		635	Nov 30/81
71-00-00		A521	Feb 28/81	71-00-00		636	Nov 30/81
71-00-00		A522	Feb 28/81	71-00-00		637	Nov 30/81
71-00-00		A523	Feb 28/81	71-00-00		638	Nov 30/81
71-00-00		A524	Feb 28/81	71-00-00		639	Nov 30/81
71-00-00		A525	Feb 28/81	71-00-00		640	Nov 30/81
71-00-00		A526	Feb 28/81	71-00-00		641	Nov 30/81
71-00-00		A527	Feb 28/81	71-00-00		642	Nov 30/81
71-00-00		A528	Feb 28/81	71-00-00		643	Nov 30/81
71-00-00		A529	Feb 28/81	71-00-00		644	May 30/81
71-00-00		601	Sep 30/90	71-00-00	R	645	May 31/03
71-00-00		602	Sep 30/90	71-00-00	R	646	May 31/03
71-00-00		602A	Sep 30/90	71-00-00		647	Nov 30/83
71-00-00		602B	Mar 30/01	71-00-00	R	648	May 31/03
71-00-00		603	Mar 31/00	71-00-00	R	649	May 31/03
71-00-00		604	Mar 31/00	71-00-00	R	650	May 31/03
71-00-00		605	Mar 31/00	71-00-00	N	650A	May 31/03
71-00-00		606	Mar 31/00	71-00-00	N	650B	May 31/03
71-00-00		607	Sep 30/93	71-00-00	N	650C	May 31/03
71-00-00		608	Mar 29/96	71-00-00	N	650D	May 31/03

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
71-00-00		651	Mar 31/00	71-00-11		431	Nov 30/80
71-00-00		652	Mar 31/00	71-00-11		432	Nov 30/80
71-00-00		653	Sep 30/93	71-00-11		433	Nov 30/80
71-00-00		654	Sep 30/93	71-00-11		434	Nov 30/80
71-00-00		655	Sep 30/93	71-00-11		435	Nov 30/80
71-00-00		656	Sep 30/93	71-00-11		436	Nov 30/80
71-00-00		657	Sep 30/93	71-00-11		437	Nov 30/80
71-00-00		701	Feb 28/77	71-00-11		438	Nov 30/80
71-00-00		702	Feb 28/77	71-00-11		439	Nov 30/80
71-00-00		703	Aug 30/77	71-00-12		1	Nov 30/80
71-00-00		704	Aug 30/77	71-00-12		2	Sep 30/87
71-00-00		705	Aug 30/77	71-00-12		3	Sep 30/87
71-00-00		706	Mar 28/02	71-00-12		4	Sep 30/87
71-00-00		707	Aug 30/77	71-00-12		5	Sep 30/87
71-00-00		708	Mar 28/02	71-00-12		6	Sep 30/87
71-00-00		708A	Mar 28/02	71-00-12		7	Feb 28/81
71-00-00		708B	Mar 28/02	71-00-12		8	Sep 30/87
71-00-00		709	Mar 28/02	71-00-12		9	Sep 30/87
71-00-00		710	May 30/81	71-00-12		10	Feb 28/81
71-00-00		711	May 30/81	71-00-12		11	Sep 30/87
71-00-11		401	Nov 30/80	71-00-12		12	Sep 30/87
71-00-11		402	Nov 30/80	71-00-12		13	Sep 30/87
71-00-11		403	Nov 30/80	71-00-12		14	Sep 30/87
71-00-11		404	Nov 30/80	71-00-12		15	Sep 30/87
71-00-11		405	Nov 30/80	71-00-12		16	Feb 28/81
71-00-11		406	Nov 30/80	71-00-12		17	Feb 28/81
71-00-11		407	Nov 30/80	71-00-12		18	Sep 30/87
71-00-11		408	Nov 30/76	71-00-12		401	Aug 30/81
71-00-11		409	Nov 30/76	71-00-12		402	Sep 30/93
71-00-11		410	Nov 30/78	71-00-12		403	Sep 30/87
71-00-11		411	Nov 30/78	71-00-12		404	Aug 30/81
71-00-11		412	Nov 30/80	71-00-12		405	Aug 30/81
71-00-11		413	Nov 30/80	71-00-12		406	Aug 30/81
71-00-11		414	Nov 30/78	71-00-12		407	Aug 30/81
71-00-11		415	Nov 30/80	71-00-12		408	Aug 30/81
71-00-11		416	Aug 30/80	71-00-12		409	Mar 31/95
71-00-11		417	Aug 30/80	71-00-12		410	Mar 31/95
71-00-11		418	Mar 31/98	71-00-12		411	Mar 31/95
71-00-11		419	Nov 30/80	71-00-12		412	Mar 31/95
71-00-11		420	Mar 31/98	71-00-12		413	Mar 31/95
71-00-11		421	Nov 30/78	71-00-12		414	Mar 31/95
71-00-11		422	Aug 30/79	71-00-12		415	Aug 30/81
71-00-11		423	Nov 30/80	71-00-12		416	Aug 30/81
71-00-11		424	Nov 30/80	71-00-12		417	Aug 30/81
71-00-11		425	May 30/82	71-00-12		418	Aug 30/81
71-00-11		426	Mar 31/98	71-00-12		419	Sep 30/87
71-00-11		427	Mar 31/98	71-00-12		420	Aug 30/81
71-00-11		428	Nov 30/80	71-00-12		421	Sep 30/87
71-00-11		429	Nov 30/80	71-00-12		422	Sep 30/87
71-00-11		430	Nov 30/80	71-00-12		423	Aug 30/81

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71-00-12		424	Aug 30/81	71-00-12		472	Sep 30/93
71-00-12		425	Aug 30/81	71-00-12		473	Nov 30/84
71-00-12		426	Aug 30/81	71-00-12		474	Aug 30/81
71-00-12		427	Aug 30/81	71-00-12		475	Aug 30/81
71-00-12		428	Aug 30/81	71-00-12		476	Sep 30/93
71-00-12		429	Aug 30/81	71-00-12		477	Aug 30/81
71-00-12		430	Aug 30/81	71-00-12		478	Sep 30/93
71-00-12		431	Aug 30/81	71-00-12		479	Aug 30/81
71-00-12		432	Aug 30/81	71-00-12		480	Aug 30/81
71-00-12		433	Aug 30/81	71-00-12		481	Aug 30/81
71-00-12		434	Aug 30/81	71-00-12		482	Aug 30/81
71-00-12		435	Aug 30/81	71-00-12		483	Aug 30/81
71-00-12		436	Aug 30/81	71-00-12		484	Aug 30/81
71-00-12		437	Aug 30/81	71-00-12		485	Aug 30/81
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71-00-12		441	Aug 30/81	71-00-12		489	Mar 27/97
71-00-12		442	Aug 30/81	71-00-13		101	Mar 28/02
71-00-12		443	Aug 30/81	71-00-13		401	Aug 30/80
71-00-12		444	Aug 30/81	71-00-13		402	Aug 30/80
71-00-12		445	Aug 30/81	71-00-13		403	Aug 30/80
71-00-12		446	Aug 30/81	71-00-13		404	May 30/80
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71-00-12		460	Mar 31/99	71-00-13		418	Mar 28/02
71-00-12		461	Aug 30/81	71-00-13		419	Mar 28/02
71-00-12		462	Mar 31/98	71-00-14		401	Mar 28/02
71-00-12		463	Sep 30/93	71-00-14		402	Mar 28/02
71-00-12		464	Sep 30/93	71-00-14		403	Mar 28/02
71-00-12		465	Sep 30/93	71-00-21		101	Nov 30/78
71-00-12		466	Aug 30/81	71-00-21		102	May 30/78
71-00-12		467	Aug 30/81	71-00-21		103	May 30/78
71-00-12		468	Mar 31/98	71-00-21		104	May 30/78
71-00-12		468A	Mar 31/98	71-00-21		105	May 30/78
71-00-12		468B	Sep 30/93	71-00-21		106	Nov 30/75
71-00-12		469	Mar 31/98	71-00-21		107	May 30/78
71-00-12		470	Sep 30/93	71-00-21		108	May 30/78
71-00-12		471	Sep 30/93	71-00-21		109	Nov 30/75

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71-00-21		111	Nov 30/75	71-00-25		103	Nov 30/77
71-00-21		112	May 30/78	71-00-25		104	Nov 30/77
71-00-21		113	Mar 31/00	71-00-25		105	Nov 30/77
71-00-21		114	Mar 31/00	71-00-25		106	May 30/76
71-00-21		115	Mar 31/00	71-00-25		107	May 30/76
71-00-21		116	Mar 31/00	71-00-25		108	May 30/76
71-00-21		117	Nov 30/75	71-00-25		109	May 30/76
71-00-21		118	May 30/78	71-00-25		110	May 30/76
71-00-21		119	May 30/78	71-00-25		111	Aug 30/78
71-00-21		120	Nov 30/75	71-00-25		112	May 30/76
71-00-21		121	Mar 31/99	71-00-25		113	May 30/76
71-00-21		122	Nov 30/75	71-00-25		114	May 30/76
71-00-21		123	Nov 30/79	71-00-25		115	May 30/76
71-00-21		124	Nov 30/79	71-00-25		116	Aug 30/78
71-00-21		125	Nov 30/79	71-00-25		117	Aug 30/78
71-00-21		126	Nov 30/79	71-00-25		118	Aug 30/78
71-00-21		127	Nov 30/79	71-00-25		119	Aug 30/78
71-00-21		128	Nov 30/79	71-00-25		120	Aug 30/78
71-00-22		101	Sep 30/86	71-00-25		121	Aug 30/78
71-00-22		102	Aug 30/78	71-00-25		122	May 30/76
71-00-22		103	Aug 30/78	71-00-25		123	Aug 30/78
71-00-22		104	Aug 30/78	71-00-25		124	May 30/76
71-00-22		105	Sep 30/86	71-00-25		125	May 30/76
71-00-22		106	Aug 30/78	71-00-25		126	May 30/76
71-00-22		107	Aug 30/78	71-00-25		127	Aug 30/78
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71-00-22		109	Nov 30/79	71-00-25		129	May 30/76
71-00-22		110	Nov 30/79	71-00-25		130	May 30/76
71-00-24		101	Sep 30/93	71-00-25		131	May 30/76
71-00-24		102	Sep 30/93	71-00-25		132	May 30/76
71-00-24		103	Feb 28/77	71-00-25		133	May 30/76
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71-00-24		106	May 30/79	71-00-25		136	May 30/76
71-00-24		107	May 30/79	71-00-25		137	May 30/76
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71-00-24		109	Nov 30/79	71-00-25		139	May 30/76
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71-00-24		112	Nov 30/79	71-00-25		142	May 30/76
71-00-24		113	Nov 30/79	71-00-25		143	May 30/76
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71-00-24		116	Sep 30/93	71-00-25		146	May 30/76
71-00-24		117	May 30/80	71-00-25		147	May 30/76
71-00-24		118	May 30/83	71-00-25		148	May 30/76
71-00-24		119	May 30/80	71-00-25		149	May 30/76
71-00-24		120	Sep 30/93	71-00-25		150	May 30/76
71-00-25		101	Nov 30/84	71-00-25		151	Aug 30/78

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71-00-25		152	Nov 30/79	71-00-27		113	Nov 30/75
71-00-25		153	Nov 30/79	71-00-27		114	Sep 30/92
71-00-25		154	Nov 30/79	71-00-27		115	Mar 31/00
71-00-25		155	Nov 30/79	71-00-27		116	Mar 31/00
71-00-25		156	Nov 30/79	71-00-27		117	Mar 31/00
71-00-25		157	Nov 30/79	71-00-27		118	Mar 31/00
71-00-25		158	Nov 30/79	71-00-27		119	Mar 31/00
71-00-25		159	Nov 30/79	71-00-27		120	Mar 31/00
71-00-25		160	Nov 30/79	71-00-27		121	Nov 30/79
71-00-25		161	Nov 30/79	71-00-27		122	Nov 30/79
71-00-25		162	Nov 30/79	71-00-27		123	Nov 30/79
71-00-25		163	Nov 30/79	71-00-27		124	Nov 30/79
71-00-26		101	Mar 31/00	71-00-27		125	Nov 30/79
71-00-26		102	Mar 31/00	71-00-28		101	Mar 31/00
71-00-26		103	Mar 31/00	71-00-28		102	Mar 31/00
71-00-26		104	Mar 31/00	71-00-28		103	Mar 31/00
71-00-26		105	Mar 31/00	71-00-28		104	Mar 31/00
71-00-26		106	Mar 31/00	71-00-28		105	Mar 31/00
71-00-26		107	Mar 31/00	71-00-28		106	Mar 31/00
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71-00-26		119	Mar 31/00	71-00-29		108	Aug 30/75
71-00-26		120	Mar 31/00	71-00-29		109	Aug 30/75
71-00-26		121	Mar 31/00	71-00-29		110	Aug 30/75
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71-00-26		123	Mar 31/00	71-00-29		112	Aug 30/75
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71-00-26		126	Mar 31/00	71-00-29		115	Aug 30/75
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71-00-27		102	Sep 30/92	71-00-29		117	Nov 30/79
71-00-27		103	Feb 28/77	71-00-29		118	Nov 30/79
71-00-27		104	Feb 28/77	71-00-29		119	Nov 30/79
71-00-27		105	Nov 30/75	71-00-29		120	Nov 30/79
71-00-27		106	Sep 30/92	71-00-31		101	Mar 31/95
71-00-27		107	Nov 30/75	71-00-31		102	Mar 31/95
71-00-27		108	Nov 30/75	71-00-31		103	Mar 31/95
71-00-27		109	Nov 30/75	71-00-31		104	Feb 28/78
71-00-27		110	Nov 30/75	71-00-31		105	Nov 30/75
71-00-27		111	Nov 30/75	71-00-31		106	Nov 30/75
71-00-27		112	Nov 30/75	71-00-31		107	Nov 30/75

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71-00-31		108	Nov 30/75	71-00-34		113	Nov 30/75
71-00-31		109	Nov 30/75	71-00-34		114	Nov 30/75
71-00-31		110	Nov 30/75	71-00-34		115	Nov 30/75
71-00-31		111	Feb 28/78	71-00-34		116	Nov 30/83
71-00-31		112	Mar 31/95	71-00-34		116 A	Nov 30/85
71-00-31		113	Nov 30/79	71-00-34		116 B	Nov 30/83
71-00-31		114	Nov 30/79	71-00-34		117	Nov 30/85
71-00-31		115	Nov 30/79	71-00-34		118	Nov 30/85
71-00-31		116	Nov 30/79	71-00-34		119	Nov 30/85
71-00-31		117	Mar 31/95	71-00-34		120	Nov 30/85
71-00-33		101	Jun 30/75	71-00-34		121	May 30/81
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71-00-33		106	Aug 30/78	71-00-34		126	May 30/81
71-00-33		107	Aug 30/78	71-00-34		127	May 30/81
71-00-33		108	Aug 30/78	71-00-34		128	May 30/81
71-00-33		109	Aug 30/78	71-00-35		101	Feb 28/77
71-00-33		110	Aug 30/78	71-00-35		102	Aug 30/75
71-00-33		111	Aug 30/78	71-00-35		103	Aug 30/78
71-00-33		112	Aug 30/78	71-00-35		104	May 30/79
71-00-33		113	Aug 30/78	71-00-35		105	May 30/79
71-00-33		114	Aug 30/76	71-00-35		106	Aug 30/78
71-00-33		115	Aug 30/78	71-00-35		107	Nov 30/79
71-00-33		116	Aug 30/78	71-00-35		108	Nov 30/79
71-00-33		117	Aug 30/78	71-00-36		101	May 30/79
71-00-33		118	Aug 30/78	71-00-36		102	Feb 28/77
71-00-33		119	Aug 30/76	71-00-36		103	May 30/79
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71-00-33		128	Nov 30/79	71-00-37		103	Jun 30/75
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71-00-34		108	Nov 30/75	71-00-37		111	Nov 30/79
71-00-34		109	Nov 30/83	71-00-37		112	Nov 30/79
71-00-34		110	Nov 30/75	71-00-37		113	Nov 30/79
71-00-34		111	Nov 30/83	71-00-39		101	Aug 30/76
71-00-34		112	Nov 30/75	71-00-39		102	Aug 30/76

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71-00-39		102 A	Sep 30/88	71-00-39		142	Nov 30/77
71-00-39		102 B	Sep 30/88	71-00-39		143	Nov 30/77
71-00-39		102 C	Sep 30/88	71-00-39		144	Nov 30/77
71-00-39		102 D	Sep 30/88	71-00-39		145	Nov 30/77
71-00-39		102 E	Sep 30/88	71-00-39		146	Nov 30/77
71-00-39		102 F	Sep 30/88	71-00-39		147	Nov 30/77
71-00-39		102 G	Sep 30/88	71-00-39		148	Nov 30/77
71-00-39		102 H	Sep 30/88	71-00-39		149	May 30/78
71-00-39		102 J	Sep 30/88	71-00-39		150	Nov 30/77
71-00-39		102 K	Sep 30/88	71-00-39		151	Nov 30/77
71-00-39		102 L	Sep 30/88	71-00-39		152	Nov 30/77
71-00-39		103	Nov 30/81	71-00-39		153	Nov 30/77
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71-00-39		107	Aug 30/78	71-00-39		157	Nov 30/77
71-00-39		108	Aug 30/78	71-00-39		158	Nov 30/77
71-00-39		109	Aug 30/78	71-00-39		159	Nov 30/77
71-00-39		110	Aug 30/78	71-00-39		160	May 30/78
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71-00-39		112	Aug 30/78	71-00-39		162	Aug 30/78
71-00-39		113	Aug 30/78	71-00-39		163	Nov 30/77
71-00-39		114	Aug 30/78	71-00-39		164	Nov 30/77
71-00-39		115	Nov 30/81	71-00-39		165	May 30/78
71-00-39		116	Aug 30/78	71-00-39		166	Nov 30/77
71-00-39		117	Aug 30/78	71-00-39		167	Nov 30/77
71-00-39		118	Aug 30/78	71-00-39		168	Nov 30/77
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71-00-39		123	Nov 30/77	71-00-39		173	Nov 30/77
71-00-39		124	Nov 30/77	71-00-39		174	May 30/78
71-00-39		125	Aug 30/78	71-00-39		175	Nov 30/77
71-00-39		126	May 30/78	71-00-39		176	Nov 30/77
71-00-39		127	Nov 30/77	71-00-39		177	Nov 30/77
71-00-39		128	May 30/78	71-00-39		178	Aug 30/78
71-00-39		129	May 30/78	71-00-39		179	Nov 30/80
71-00-39		130	Nov 30/77	71-00-39		180	Nov 30/80
71-00-39		131	Nov 30/77	71-00-39		181	Nov 30/80
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71-00-39		137	May 30/78	71-00-39		187	Nov 30/80
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71-00-39		139	Aug 30/78	71-00-39		189	Nov 30/80
71-00-39		140	Nov 30/77	71-00-39		190	Nov 30/80
71-00-39		141	May 30/78	71-00-39		191	Nov 30/80

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71-00-39		193	Nov 30/80	71-00-39		A143	Sep 30/88
71-00-39		194	Nov 30/80	71-00-39		A144	Sep 30/88
71-00-39		195	Nov 30/80	71-00-39		A145	Sep 30/88
71-00-39		196	Nov 30/80	71-00-39		A146	Sep 30/88
71-00-39		197	Nov 30/80	71-00-39		A147	Sep 30/88
71-00-39		198	Nov 30/80	71-00-39		A148	Sep 30/88
71-00-39		199	Nov 30/80	71-00-39		A149	Sep 30/88
71-00-39		A100	Nov 30/80	71-00-39		A150	Sep 30/88
71-00-39		A101	Nov 30/80	71-00-39		A151	Sep 30/88
71-00-39		A102	Nov 30/80	71-00-39		A152	Sep 30/88
71-00-39		A103	Nov 30/80	71-00-39		A153	Sep 30/88
71-00-39		A104	Nov 30/80	71-00-39		A154	Sep 30/88
71-00-39		A105	Nov 30/80	71-00-39		A155	Sep 30/88
71-00-39		A106	Nov 30/80	71-00-39		A156	Sep 30/88
71-00-39		A107	Nov 30/80	71-00-39		A157	Sep 30/88
71-00-39		A108	Nov 30/80	71-00-39		A158	Sep 30/88
71-00-39		A109	Nov 30/80	71-00-39		A159	Sep 30/88
71-00-39		A110	Nov 30/80	71-00-39		A160	Sep 30/88
71-00-39		A111	Nov 30/80	71-00-39		A161	Sep 30/88
71-00-39		A112	Nov 30/80	71-00-39		A162	Sep 30/88
71-00-39		A113	Nov 30/80	71-00-39		A163	Sep 30/88
71-00-39		A114	Nov 30/80	71-00-39		A164	Sep 30/88
71-00-39		A115	Nov 30/80	71-00-39		A165	Sep 30/88
71-00-39		A116	Nov 30/80	71-00-41		101	Nov 30/76
71-00-39		A117	Nov 30/80	71-00-41		102	Nov 30/76
71-00-39		A118	Nov 30/80	71-00-41		103	Nov 30/76
71-00-39		A119	Nov 30/80	71-00-41		104	Nov 30/76
71-00-39		A120	Nov 30/80	71-00-41		105	Nov 30/76
71-00-39		A121	Nov 30/80	71-00-41		106	Aug 30/78
71-00-39		A122	Nov 30/80	71-00-41		107	Aug 30/78
71-00-39		A123	Nov 30/80	71-00-41		108	Aug 30/78
71-00-39		A124	Nov 30/80	71-00-41		109	Aug 30/78
71-00-39		A125	Nov 30/80	71-00-41		110	Aug 30/78
71-00-39		A126	Nov 30/80	71-00-41		111	Nov 30/76
71-00-39		A127	Nov 30/80	71-00-41		112	Nov 30/76
71-00-39		A128	Nov 30/80	71-00-41		113	Nov 30/76
71-00-39		A129	Nov 30/80	71-00-41		114	Aug 30/78
71-00-39		A130	Nov 30/80	71-00-41		115	Aug 30/78
71-00-39		A131	Sep 30/88	71-00-41		116	Aug 30/78
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71-00-39		A133	Sep 30/88	71-00-41		118	Nov 30/76
71-00-39		A134	Sep 30/88	71-00-41		119	Nov 30/76
71-00-39		A135	Sep 30/88	71-00-41		120	Nov 30/76
71-00-39		A136	Sep 30/88	71-00-41		121	Nov 30/76
71-00-39		A137	Sep 30/88	71-00-41		122	Nov 30/76
71-00-39		A138	Sep 30/88	71-00-41		123	Aug 30/78
71-00-39		A139	Sep 30/88	71-00-41		124	Aug 30/78
71-00-39		A140	Sep 30/88	71-00-41		125	Nov 30/79
71-00-39		A141	Sep 30/88	71-00-41		126	Nov 30/79

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71-00-42		102	Aug 30/76	71-00-43		118	Mar 31/00
71-00-42		103	Aug 30/76	71-00-43		119	Mar 31/00
71-00-42		104	Aug 30/76	71-00-43		120	Mar 31/00
71-00-42		105	Aug 30/76	71-00-43		121	Mar 31/00
71-00-42		106	Aug 30/78	71-00-44		101	Nov 30/80
71-00-42		107	Aug 30/78	71-00-44		102	Mar 31/00
71-00-42		108	Aug 30/78	71-00-44		103	May 30/82
71-00-42		109	Aug 30/78	71-00-44		104	Aug 30/81
71-00-42		110	Aug 30/78	71-00-44		105	Aug 30/81
71-00-42		111	Feb 28/79	71-00-44		106	Aug 30/81
71-00-42		112	Feb 28/79	71-00-44		107	Aug 30/81
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71-00-42		134	Nov 30/79	71-00-45		101	Nov 30/75
71-00-43		101	Nov 30/75	71-00-45		102	Sep 30/92
71-00-43		102	Mar 31/98	71-00-45		103	Nov 30/75
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71-00-43		105	Mar 31/00	71-00-45		106	Nov 30/75
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71-00-43		113	Mar 31/00	71-00-46		103	Mar 31/95
71-00-43		114	Mar 31/00	71-00-46		104	May 30/79
71-00-43		115	Mar 31/00	71-00-46		105	Mar 31/99

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71-00-46		106	Mar 31/95	71-00-48		145	May 30/82
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71-00-46		108	Nov 30/79	71-00-48		147	May 30/82
71-00-46		109	Nov 30/79	71-00-48		148	May 30/82
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71-00-48		103	May 30/82	71-00-48		151	May 30/82
71-00-48		104	May 30/82	71-00-48		152	May 30/82
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71-00-48		117	May 30/82	71-00-48		165	May 30/83
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71-00-48		120	May 30/82	71-00-48		168	May 30/82
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71-00-48		132	May 30/82	71-00-49		102 A	Nov 30/84
71-00-48		133	May 30/82	71-00-49		103	May 30/82
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71-00-48		136	May 30/82	71-00-49		106	May 30/82
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71-00-48		138	May 30/82	71-00-49		108	Nov 30/81
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71-00-48		140	May 30/82	71-00-49		110	Mar 31/95
71-00-48		141	May 30/82	71-00-49		110 A	Mar 31/95
71-00-48		142	May 30/82	71-00-49		110 B	Mar 31/95
71-00-48		143	May 30/82	71-00-49		111	Feb 28/81
71-00-48		144	May 30/82	71-00-49		112	Feb 28/81
71-00-48		144 A	May 30/82	71-00-49		113	Feb 28/81
71-00-48		144 B	May 30/82	71-00-49		114	Nov 30/81

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71-00-49		117	Feb 28/81	71-00-50		110	May 30/76
71-00-49		118	Feb 28/81	71-00-50		111	Nov 30/77
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71-00-49		120	Feb 28/81	71-00-50		113	Nov 30/79
71-00-49		121	Feb 28/81	71-00-50		114	Nov 30/79
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71-00-49		141	Mar 31/95	71-00-51		115	Nov 30/80
71-00-49		142	Feb 28/81	71-00-51		116	Mar 31/95
71-00-49		143	Mar 31/95	71-00-51		116A	Mar 31/95
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71-00-49		156	Feb 28/81	71-00-51		128	May 30/80
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71-00-50		101	Aug 30/75	71-00-51		130	May 30/80
71-00-50		102	Aug 30/75	71-00-51		131	May 30/80
71-00-50		103	Aug 30/78	71-00-51		132	May 30/80
71-00-50		104	Aug 30/78	71-00-51		133	May 30/80
71-00-50		105	Aug 30/78	71-00-51		134	May 30/80
71-00-50		106	May 30/76	71-00-51		135	May 30/80
71-00-50		107	Aug 30/78	71-00-51		136	May 30/80

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71-00-51		139	May 30/80	71-00-56		106	Nov 30/82
71-00-51		140	May 30/80	71-00-56		107	Aug 30/81
71-00-51		141	May 30/80	71-00-56		108	Aug 30/81
71-00-51		142	May 30/80	71-00-56		109	Mar 31/95
71-00-53		101	Nov 30/75	71-00-56		110	Mar 29/96
71-00-53		102	Nov 30/75	71-00-57		101	Mar 31/95
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71-00-54		104	Nov 30/81	71-00-58	R	101	May 31/03
71-00-54		105	Nov 30/81	71-00-58	R	102	May 31/03
71-00-54		106	Nov 30/81	71-00-58		103	Mar 28/02
71-00-54		107	Nov 30/81	71-00-58		104	Mar 28/02
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71-00-54		111	Nov 30/81	71-00-58		108	Mar 31/99
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71-00-55		101	Nov 30/75	71-21-00		2	Feb 28/79
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71-00-55		103	Nov 30/75	71-21-00		4	May 30/80
71-00-55		104	Nov 30/75	71-21-00		401	Sep 30/90
71-00-55		105	Nov 30/75	71-21-00		402	Sep 30/90
71-00-55		106	Nov 30/75	71-21-00		403	Sep 30/90
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71-00-55		110	Nov 30/75	71-21-00		604	Nov 30/85
71-00-55		111	Nov 30/75	71-21-00		605	Nov 30/85
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71-00-55		113	Nov 30/79	71-21-00		607	Nov 30/85
71-00-55		114	Nov 30/79	71-21-00		608	Nov 30/85
71-00-55		115	Nov 30/79	71-21-00		609	Nov 30/85
71-00-55		116	Nov 30/79	71-21-11		401	Feb 28/81
71-00-56		101	Mar 29/96	71-21-11		402	May 30/76
71-00-56		102	Mar 31/95	71-21-11		403	Feb 28/81
71-00-56		103	Mar 29/96	71-21-11		404	Feb 28/81

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71-21-11		406	Feb 28/81	71-31-00		304	Nov 30/77
71-21-11		407	Feb 28/81	71-31-00		401	Nov 30/85
71-21-11		408	Feb 28/81	71-31-00		402	Nov 30/85
71-21-11		409	Feb 28/81	71-31-00		403	May 30/77
71-21-11		410	Feb 28/81	71-31-00		404	Sep 30/87
71-21-11		411	Feb 28/81	71-31-00		405	Nov 30/85
71-21-11		601	Aug 30/77	71-31-00		406	Nov 30/85
71-21-11		602	Nov 30/82	71-31-00		407	Nov 30/85
71-21-11		603	Sep 29/89	71-31-00		408	Nov 30/85
71-21-11		604	Sep 29/89	71-31-00		409	Sep 30/90
71-21-13		401	Aug 30/80	71-31-00		410	Nov 30/85
71-21-13		402	Aug 30/76	71-31-00		411	Nov 30/85
71-21-13		403	Aug 30/76	71-31-00		412	Nov 30/85
71-21-13		404	Aug 30/80	71-31-00		413	Nov 30/85
71-21-13		405	Aug 30/76	71-31-00		414	Nov 30/85
71-21-13		406	Aug 30/80	71-31-00		415	Nov 30/85
71-21-13		407	Aug 30/80	71-31-00		416	Nov 30/85
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71-21-13		409	Aug 30/80	71-31-00		418	Nov 30/85
71-21-13		410	Aug 30/80	71-31-00		419	Nov 30/85
71-21-13		411	Aug 30/80	71-31-00		501	Nov 30/80
71-21-14		401	Nov 30/79	71-31-00		502	Nov 30/84
71-21-14		402	May 30/79	71-31-00		503	Nov 30/80
71-21-14		403	May 30/79	71-31-00		504	Nov 30/80
71-21-14		404	May 30/79	71-31-00		505	Nov 30/84
71-21-14		405	May 30/79	71-31-00		506	Sep 29/89
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71-30-00		1	Jun 30/75	71-31-00		508	Nov 30/84
71-30-00		2	Nov 30/78	71-31-00		509	Nov 30/80
				71-31-00		510	Nov 30/80
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71-31-00		3	Feb 28/78	71-31-00		513	Nov 30/80
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71-31-00		6	Nov 30/77	71-31-00		516	Nov 30/80
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71-31-00		13	Feb 28/78	71-31-00		702	Aug 30/79
71-31-00		14	Nov 30/82	71-31-00		703	Aug 30/79
71-31-00		15	Feb 28/78	71-31-00		704	Aug 30/79
71-31-00		16	Feb 28/78	71-31-00		705	Aug 30/79
71-31-00		17	Feb 28/78	71-31-00		706	Aug 30/80
71-31-00		301	Nov 30/77	71-31-00		707	Aug 30/80
71-31-00		302	Feb 28/77	71-31-11		401	Aug 30/80

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71-31-11		403	Jun 30/75	71-31-14		504	Nov 30/77
71-31-11		404	Aug 30/80	71-31-14		505	Nov 30/77
71-31-11		405	Aug 30/80	71-31-15		401	Nov 30/80
71-31-11		406	Aug 30/80	71-31-15		402	Nov 30/80
71-31-11		501	Nov 30/80	71-31-15		403	Nov 30/77
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71-31-11		505	Nov 30/80	71-31-15		407	Nov 30/80
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71-31-12		402	May 30/83	71-31-15		409	Nov 30/80
71-31-12		402 A	May 30/83	71-31-16		401	Nov 30/80
71-31-12		403	Nov 30/77	71-31-16		402	Nov 30/80
71-31-12		404	Aug 30/79	71-31-16		403	Nov 30/80
71-31-12		405	Aug 30/79	71-31-16		404	Feb 28/78
71-31-12		406	Aug 30/79	71-31-16		405	Nov 30/80
71-31-12		407	Mar 29/96	71-31-16		406	Nov 30/80
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71-31-12		411	Aug 30/79	71-31-16		503	Nov 30/80
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71-31-13		303	Mar 28/02	71-32-00		7	Mar 28/02
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71-31-13		403	Aug 30/80	71-32-02		403	Feb 28/77
71-31-13		404	Nov 30/83	71-32-02		601	Aug 30/77
71-31-13		405	Nov 30/83	71-32-02		602	Aug 30/77
71-31-13		406	Aug 30/80	71-32-02		603	Aug 30/77
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71-31-14		402	Nov 30/77	71-32-11		403	Mar 28/02
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71-31-14		405	May 30/76	71-32-11		406	Mar 28/02
71-31-14		406	Nov 30/77	71-32-11		601	Sep 30/93
71-31-14		407	Nov 30/77	71-32-11		602	Feb 28/79
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71-31-14		409	Nov 30/77	71-32-11		604	Sep 30/93
71-31-14		410	Nov 30/77	71-32-11		801	Mar 28/02
71-31-14		501	May 30/76	71-32-11		802	Mar 28/02
71-31-14		502	May 30/76	71-32-11		803	Mar 28/02

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71-32-11		808	Mar 28/02	71-41-00		4	Jun 30/75
71-32-11		809	Mar 28/02	71-41-00		5	Nov 30/85
71-32-11		810	Mar 28/02	71-41-00		6	Nov 30/85
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71-32-11		814	Mar 28/02	71-41-00		401	Mar 27/97
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71-32-11		816	Mar 28/02	71-41-00		403	Mar 27/97
71-32-11		817	Mar 28/02	71-41-00		404	Mar 27/97
71-32-11		818	Mar 28/02	71-41-00		405	Mar 27/97
71-32-11		819	Mar 28/02	71-41-00		406	Mar 27/97
71-32-11		820	Mar 28/02	71-41-00		407	Mar 27/97
71-32-11		821	Mar 28/02	71-41-11		601	Nov 30/83
71-32-11		822	Mar 28/02	71-41-11		602	Nov 30/83
71-32-11		823	Mar 28/02	71-41-11		801	Nov 30/83
71-32-11		824	Mar 28/02	71-41-11		802	Nov 30/83
71-32-11		825	Mar 28/02				
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71-32-12		402	Mar 28/02	71-50-00		2	Nov 30/79
71-32-12		403	Mar 28/02	71-50-00		3	Mar 31/95
71-32-12		404	Mar 28/02	71-50-00		4	Mar 31/95
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71-32-12		407	Mar 28/02	71-50-00		7	Mar 31/95
71-32-12		601	Sep 30/93	71-50-00	R	401	May 31/03
71-32-12		602	Sep 30/93	71-50-00	R	402	May 31/03
71-32-12		603	Feb 19/80	71-50-00		403	Mar 31/95
71-32-12		604	Nov 30/79	71-50-00		404	Mar 31/95
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71-32-12		607	Sep 30/93	71-50-00		407	Mar 31/95
71-32-12		608	Sep 30/93	71-50-00	R	408	May 31/03
71-32-13		401	May 30/78	71-50-00	R	409	May 31/03
71-32-13		402	May 30/78	71-50-00	R	410	May 31/03
71-32-13		403	Feb 18/78	71-50-00		411	Mar 31/95
71-32-13		404	Feb 18/78	71-50-00		501	Aug 30/76
71-32-13		405	May 30/78	71-50-00		502	Nov 30/77
71-32-13		406	May 30/78	71-50-00		503	Nov 30/78
71-32-14		801	Mar 28/02	71-50-00		504	Nov 30/78
71-32-15		401	May 30/82	71-50-00		505	Nov 30/77
71-32-15		402	Nov 30/82	71-50-00		506	Nov 30/77
71-32-15		403	Nov 30/82	71-50-00		507	Aug 30/79
71-32-17		401	Nov 30/84	71-50-00		508	Sep 30/86
71-32-17		402	May 30/84	71-50-00		509	Feb 28/77
71-32-17		403	Nov 30/84	71-50-00		510	Sep 30/86

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71-50-00		513	May 30/79	71-51-01		824	May 30/78
71-50-00		514	Nov 30/78	71-51-01		825	May 30/78
71-50-00		515	Aug 30/76	71-51-01		826	May 30/78
71-50-00		516	May 30/76	71-51-01		827	May 30/78
71-50-00		517	Sep 30/86	71-51-01		828	May 30/78
71-50-00		518	Aug 30/76	71-51-01		829	May 30/78
71-50-00		519	Mar 31/95	71-51-01		830	May 30/78
71-50-00		520	Aug 30/76	71-51-01		831	May 30/78
71-50-00		521	Aug 30/76	71-51-01		832	May 30/78
71-50-00		522	Aug 30/76	71-51-01		833	May 30/78
71-50-00		523	Sep 30/86	71-51-01		834	May 30/78
71-50-00		524	Aug 30/76	71-51-01		835	May 30/78
71-50-00		525	Aug 30/76	71-51-01		836	May 30/78
71-50-00		526	Mar 31/95	71-51-01		837	May 30/78
71-50-00		527	Nov 30/77	71-51-01		838	May 30/78
71-50-00		528	Aug 30/76	71-51-01		839	May 30/78
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71-50-00		530	Aug 30/76	71-51-01		841	May 30/78
71-50-00		531	Sep 30/86				
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71-50-00		602	May 30/76	71-61-00		7	Aug 30/75
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71-51-01		801	May 30/78	71-61-00		9	Nov 30/75
71-51-01		802	May 30/78	71-61-00		10	Nov 30/75
71-51-01		803	May 30/78	71-61-00		11	Nov 30/76
71-51-01		804	May 30/78	71-61-00		12	Nov 30/76
71-51-01		805	May 30/78	71-61-00		13	Nov 30/76
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71-51-01		813	May 30/78	71-61-00		21	Nov 30/76
71-51-01		814	May 30/78	71-61-00		22	Nov 30/76
71-51-01		815	May 30/78	71-61-00		23	Nov 30/76
71-51-01		816	May 30/78	71-61-00		24	May 30/80
71-51-01		817	May 30/78	71-61-00		25	Aug 30/77
71-51-01		818	May 30/78	71-61-00		26	May 30/80
71-51-01		819	May 30/78	71-61-00		27	May 30/80
71-51-01		820	May 30/78	71-61-00		28	May 30/80
71-51-01		821	May 30/78	71-61-00		29	Nov 30/76

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71-61-00		33	May 30/80	71-61-00		83	May 30/80
71-61-00		34	May 30/80	71-61-00		84	May 30/80
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71-61-00		37	May 30/80	71-61-00		87	May 30/80
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71-61-00		79	Nov 30/76	71-61-00		526	Aug 30/80

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71-61-00		531	Aug 30/80	71-61-00		581	Aug 30/80
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71-61-00		575	Aug 30/80	71-61-11		404	Nov 30/80
71-61-00		576	Aug 30/80	71-61-15		401	May 30/83

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71-61-15		403	May 30/76	71-61-29		403	Aug 30/80
71-61-16		401	May 30/80	71-61-43		401	May 30/83
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71-61-16		403	May 30/80	71-61-43		402 A	May 30/83
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71-64-14		403	Feb 28/77	71-64-15		509	May 30/79
71-64-14		404	Nov 30/76	71-64-15		510	May 30/79
71-64-14		405	Nov 30/76	71-64-15		511	May 30/79
71-64-14		406	Feb 28/79	71-64-15		512	May 30/79
71-64-14		407	Nov 30/75	71-64-15		513	May 30/79
71-64-14		408	Nov 30/75	71-64-15		514	May 30/79
71-64-14		409	Feb 29/76	71-64-15		515	May 30/79
71-64-14		410	Feb 28/79	71-64-15		516	May 30/79
71-64-14		411	Feb 28/79	71-64-15		517	May 30/79
71-64-14		412	Feb 28/79	71-64-15		518	May 30/79
71-64-14		413	Nov 30/77	71-64-16		401	Jun 30/75
71-64-14		414	Nov 30/77	71-64-16		402	May 30/81
71-64-14		415	Nov 30/76	71-64-16		403	Feb 29/76
71-64-14		416	Nov 30/76	71-64-16		404	Feb 29/76
71-64-14		417	Nov 30/76	71-64-16		405	Feb 29/76
71-64-14		418	Nov 30/77	71-64-16		406	Feb 28/79
71-64-14		419	Nov 30/76	71-64-16		407	May 30/81
71-64-14		420	Nov 30/76	71-64-16		408	Feb 28/79
71-64-14		421	Nov 30/76	71-64-16		409	May 30/81
71-64-14		422	Feb 28/79	71-64-16		410	May 30/81
71-64-14		423	Nov 30/76	71-64-16		411	May 30/81

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71-64-16		502	Aug 30/77
71-64-16		503	Aug 30/77
71-64-16		504	Aug 30/77
71-64-16		505	Aug 30/77
71-64-16		506	Aug 30/77
71-64-16		507	Feb 28/79
71-64-16		508	Feb 28/79
71-64-16		509	Feb 28/79
71-64-16		510	Feb 28/79
71-64-16		511	Feb 28/79
71-64-16		512	Feb 28/79
71-64-16		513	Feb 28/79
71-64-16		514	Feb 28/79
71-64-16		515	Feb 28/79
71-64-16		516	Feb 28/79
71-64-16		517	Feb 28/79
71-70-00		1	Nov 30/77
71-73-00		1	Sep 30/93
71-73-00		2	Nov 30/77
71-73-00		3	Nov 30/75
71-73-00		4	Nov 30/75
71-73-00		5	Nov 30/75
71-73-00		6	Sep 30/93
71-73-00		7	Nov 30/76
71-73-00		8	Sep 30/93
71-73-00		9	Sep 30/93
71-73-00		10	Sep 30/93
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71-73-01		401	May 30/78
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71-73-02		401	Aug 30/76
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71-73-02		403	Aug 30/76
71-73-02		404	Aug 30/76
71-73-02		405	Aug 30/76
71-73-02		406	Aug 30/76
71-73-03		401	May 30/76
71-73-03		402	Nov 30/75
71-73-04		401	Nov 30/75
71-73-04		402	Nov 30/75
71-73-04		403	Nov 30/75
71-73-04		404	Nov 30/75
71-73-05		401	May 30/79
71-73-05		402	Nov 30/75
71-73-05		403	May 30/79
71-73-06	R	401	May 31/03
71-73-06		402	Feb 28/79
71-73-06	R	403	May 31/03
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71-79-00		2	Feb 28/77
71-79-00		3	Feb 28/77
71-79-00		4	Feb 28/77
71-79-01		401	Nov 30/79
71-79-01		402	Nov 30/75
71-79-02		401	May 30/78
71-79-02		402	Aug 30/76
71-79-02		403	May 30/78
71-79-02		404	May 30/78
71-79-11		401	Feb 28/78
71-79-11		402	Feb 28/78
71-79-11		403	Feb 28/78

SERVICE BULLETIN LIST

In the following service bulletin list, SB indicates an aircraft manufacturers bulletin, AEB indicates an airline engineering bulletin and OL indicates an engine manufacturers bulletin (complete identification OL.593-XX-XXX).

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
OL 71-001			Applicable Power plant -Engine electrical cables - Re-routing and revised clipping of cables
OL 71-001	01		Applicable Power plant -Engine electrical cables - Re-routing and revised clipping of cables
OL 71-002			Applicable Power plant/Engine fuel and control - Tubes second stage pump to tank/Tubes reheat control unit and fuel control unit to first stage pump inlet elbow -Re-routed tubes
OL 71-002	01		Applicable Power plant/Engine fuel and control - Tubes second stage pump to tank/Tubes reheat control unit and fuel control unit to first stage pump inlet elbow -Re-routed tubes
OL 71-003			Applicable Power plant -Engine electrical cables - Additional clipping
OL 71-003	01		Applicable Power plant -Engine electrical cables - Additional clipping
OL 71-004			Embodied Power plant -Engine electrical cables - Modified electrical harness assembly
OL 71-004	01		Applicable Power plant -Engine electrical cables - Modified electrical harness assembly
OL 71-005			Applicable Power plant -Engine electrical cables - Modified cable assembly
OL 71-005	01		Applicable Power plant -Engine electrical cables - Modified cable assembly
OL 71-006			Embodied Power plant -Engine electrical cables - Wire-locking holes in HTMA free plugs

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SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
OL 71-006	01		Embodied Power plant -Engine electrical cables - Wire-locking holes in HTMA free plugs
OL 71-006	02		Embodied Power plant -Engine electrical cables - Wire-locking holes in HTMA free plugs
OL 71-007			Applicable Power plant/Engine -Engine electrical cables/Accessory gearbox case assembly RH - Service cables for hydraulic pump pressure switches tied back
OL 71-007	01		Applicable Power plant/Engine -Engine electrical cables/Accessory gearbox case assembly RH - Services cable for hydraulic pump pressure switches tied back
OL 71-008			Embodied Power plant -Tank drains -Modified fuel drains tank assembly
OL 71-008	01		Applicable Power plant -Tank drains -Modified fuel drains tank assembly
OL 71-008	02		Applicable Power plant -Tank drains -Modified fuel drains tank assembly
OL 71-008	03		Applicable Power plant - Tank drains - Modified fuel drains tank assembly
OL 71-009			Embodied Power plant -Engine electrical cables - Strain relief clamping at main break connections
OL 71-010			Embodied Power plant -Tubes component connections to overboard spill -New standard of multi-ple connector and bolt
OL 71-011			Embodied Power plant/Engine indicating/Engine - Engine electrical cables/Engine vibration transducer cable/Accessory gearbox case assembly RH -Introduction of Filotex cable ETUDE 45671
OL 71-011	01		Applicable Power plant/Engine indicating/Engine -

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
			Engine electrical cables/Engine vibration transducer cable/Accessory gearbox case assembly RH -Introduction of Filotex cable ETUDE 45671
OL 71-011	02		Applicable Power plant/Engine indicating/Engine - Engine electrical cables/Engine vibration transducer cable/Accessory gearbox case assembly RH -Introduction of Filotex cable ETUDE 45671
OL 71-012			Embodied Power plant -Engine electrical cables - Repositioning of clamp loops
OL 71-013			Applicable Power plant/Engine -Engine electrical cables/Fuel drain tubes/LP compressor exit guide case and vanes -Deletion of bracket
OL 71-014		May 30/77	Embodied Power plant -Drains tank -Introduction of a bolthead trap
OL 71-015			Embodied Power plant -Engine electrical cables - Introduction of stainless steel connectors
OL 71-015	01		Applicable Power plant -Engine electrical cables - Introduction of stainless steel connectors
OL 71-016			Embodied Power plant -Engine electrical cables - Modified wiring harness assembly -New cable at E5 position to suit anti-icing air valve solenoid reversal -New cable at E11 position -Modified tray assembly and associated clipping
OL 71-016	01		Applicable Power plant -Engine electrical cables - Modified wiring harness assembly -New cable at E5 position to suit anti-icing air valve solenoid reversal -New cable at E11 position -Modified tray assembly and associated clipping
OL 71-016	02		Applicable Power plant - Engine electrical cables - Modified wiring harness assembly - New cable at E5 position to suit anti-icing air

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
			valve solenoid reversal - New cable at E11 position - Modified tray assembly and associated clipping
OL 71-016	03		Applicable Power plant - Engine electrical cables - Modified wiring harness assembly - New cable at E5 position to suit anti-icing air valve solenoid reversal - New cable at E11 position - Modified tray assembly and associated clipping
OL 71-017			Embodied Power plant/Air - Engine electrical cables/ Engine anti-icing tubes - New tray assembly/ Modified tube assembly (rear anti-icing air supply)
OL 71-017	01		Applicable Power plant/Air - Engine electrical cables/ Engine anti-icing tubes - New tray assembly/ Modified tube assembly (rear anti-icing air supply)
OL 71-018			Applicable Power plant/Engine electrical cables- Improving tray assembly (unique point mounting)
OL 71-019			Applicable Power plant/Engine electrical cables - Deletion of G2 Services (Switch Differential Pressure) from loom G
OL 71-020			Applicable Power plant - Tube fuel drain distribution block dump valve to drains tank - Increased clearance at securing bolt locations.
R OL 71-020	01		Applicable Power plant - Tube fuel drain distribution block dump valve to drains tank - Increased clearance at securing bolt locations.
OL 71-021			Applicable Power plant - Engine heat shields turbine exhaust diffuser - Modified No.8 heat shield panel.

	SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
	OL 71-022			Embodied Power plant. Electrical cables - Short clamping screws at main break connectors
	OL 71-023			Applicable Power plant - Introduction of new connectors on all looms and vibration transducer
R	OL 71-023	01		Applicable Power plant - Introduction of new connectors on all looms and vibration transducer
	OL 71-024			Applicable Power plant/Engine indicating - Deletion of HP turbine bearing overheat indication system
R	OL 71-024	01		Applicable Power plant/Engine indicating - Deletion of HP turbine bearing overheat indication system
	OL 71-025			Applicable Power plant - Engine driven hydraulic pumps - Introduction of Abex main and standby hydraulic pumps type AP12V-043 and AP8V-5.
	OL 71-026			Applicable Power plant - Engine electrical cables - Introduction of larger solder sleeves and revised assembly procedure for straight free plugs with flyheads at solenoid valve
	OL 71-027			Applicable Power plant - Engine exhaust diffuser case - Drains assembly
R	OL 71-027	01		Applicable Power plant - Engine exhaust diffuser case - Drains assembly
	OL 71-028			Applicable Power plant - Engine electrical cables - New or modified wiring harness assembly at D6 position and associated clipping to suit : Deletion of LP compressor speed probe unit with new or modified LP compressor case to suit

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
OL 71-029			Applicable Power Plant - Hydraulic pump drain tubes - Longer clamping bolts
OL 71-030			Not Applicable Miscellaneous - Introduction of group service bulletin for record purposes only
OL 71-031			Not Applicable Power Plant - Engine mounting trunnions - Introduction of modification to new and used trunnions to improve corrosion fatigue resistance
OL 71-032			Applicable Engine - Electrical Harness - To suit RH FCU integral fly lead
OL 71-032	01		Applicable Engine - Electrical Harness - To suit RH FCU integral fly lead
OL 71-032	02		Applicable Engine - Electrical Harness - To suit RH FCU integral fly lead
OL 71-032	03		Applicable Engine - Electrical Harness - To suit RH FCU integral fly lead
OL 71-033			Applicable Power Plant - Low Oil Pressure Switch, revised cable support.
R OL 71-033	01		Not Applicable Power Plant - Low Oil Pressure Switch, revised cable support.
R OL 71-033	02		Not Applicable Power Plant - Low Oil Pressure Switch, revised cable support.

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
SB OL71-006		Feb 28/77	Embodied
SB OL71-004		Nov 30/76	Embodied
SB OL71-008		Nov 30/76	Embodied
SB OL71-032			Embodied Engine - Electrical Harness - To suit RH FCU integral fly lead
SB 20-008	01	May 30/80	Embodied
SB 21-042	02	Feb 29/80	Embodied
SB 27-043		Feb 29/80	Embodied Flight Controls - Improve maintenance of hydraulic supply selector unit by segregating supply of relays K14 and K15 from that of JAM and LOW pressure caption lights
SB 54-007		Feb 28/77	Embodied Nacelles auxiliary structure - To introduce improved rear hinge pins and side plates
SB 54-036		May 30/79	Embodied Nacelles/Pylons. Auxiliary structure engine

SERVICE BULLETIN LIST

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
			air intakes - To improve engine performance by introduction of redesigned air intake bottom lips and rear ramp leading edges.
SB 54-036	03	Aug 30/80	Embodied Nacelles/Pylons. Auxiliary structure. Engine air intakes - To improve engine performance by the introduction of redesigned air intake bottom lips and rear ramp leading edges.
SB 54-040		Aug 30/79	Embodied Nacelles/Pylons Attach Fittings - To reduce gap between fail - Safe up stop and spill door side box structure at intake sidewalls.
SB 54-040	01	May 30/80	Embodied
SB 71-001		Feb 28/78	Embodied Power plant -Air intakes -Improvement of the air intake control system (A.I.C.S.) pre flight check (P.F.C.) integrity
SB 71-001	01		Embodied Power plant -Air intakes -Improvement of the air intake control system (A.I.C.S.) pre flight check (P.F.C.) integrity
SB 71-001	02		Embodied Power plant -Air intakes -Improvement of the air intake control system (A.I.C.S.) pre flight check (P.F.C.) integrity
SB 71-001	03		Embodied Power plant -Air intakes -Improvement of the air intake control system (A.I.C.S.) pre flight check (P.F.C.) integrity
SB 71-001	04		Embodied Power plant -Air intakes -Improvement of the air intake control system (A.I.C.S.) pre flight check (P.F.C.) integrity
SB 71-002			Not applicable
SB 71-003			No effect Power plant. Heatshields -To modify centre wall balance link heatshields
SB 71-003	01		No effect Power plant. Heatshields -To modify centre wall balance link heatshields
SB 71-003	02		No effect Power plant. Heatshields -To modify centre wall balance link heatshields
SB 71-003	03		No effect

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
			Power plant. Heatshields -To modify centre wall balance link heatshields
SB 71-003	04		No effect Power plant. Heatshields -To modify centre wall balance link heatshields
SB 71-004			Embodied Power plant -Engine/intake transition joint -To introduce a tungsten carbide coated joint ring and sealing ring
SB 71-004	01		Embodied Power plant -Engine/intake transition joint -To introduce a tungsten carbide coated joint ring and sealing ring
SB 71-005			Not applicable
SB 71-006		Nov 30/76	Embodied Power plant. Heatshields -To protect engine bay pipes against fretting at secondary cross over heatshield attachments
SB 71-006	01		Embodied Power plant. Heatshields -To protect engine bay pipes against fretting at secondary cross over heatshield attachments.
SB 71-007			No effect Power plant. Air intake sensor unit -To introduce a new standard of AISU
SB 71-007	01		No effect Power plant. Air intake sensor unit -To introduce a new standard of AISU
SB 71-007	02		No effect Power Plant. Air Intake Sensor Unit - To introduce a new standard of A.I.S.U.
SB 71-008		Nov 30/76	Embodied Power plant. Underwing firewall -To improve freedom of movement of firewall panels at attachments to accommodate thermal and structural deflections
SB 71-009			Embodied Power plant. Secondary air door -Improvement to indicator switch window
SB 71-009	01		Embodied Power plant. Secondary air door -Improvement to indicator switch window
SB 71-010			Applicable Spill door actuation -To improve spill door

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
			jack reliability
SB 71-010	01		Applicable Spill door actuation -To improve spill door jack reliability
SB 71-010	02		Embodied Spill door actuation -To improve spill door jack reliability
SB 71-011			No effect Power plant. Intake/engine seal ring -To reorientate the forward seal ring through 180a
SB 71-012			Embodied Power plant. Secondary air door motor - Remove clip assembly and fit modified flexible drive
SB 71-013			No effect Power plant. Ramp actuator -To modify wiring to normal and standby resolver assemblies
SB 71-013	01		No effect Power plant. Ramp actuator -To modify wiring to normal and standby resolver assemblies
SB 71-014			No effect Power plant -Secondary air doors - Flexible drive shafts -Lubrication inspection
SB 71-014	01		No effect Power plant -Secondary air doors - Flexible drive shafts -Lubrication inspection
SB 71-015			Not applicable
SB 71-016			Applicable Power plant. Secondary air door -To replace ADC time delay slave relay
SB 71-016	01		Applicable Power plant. Secondary air door -To replace ADC time delay slave relay
SB 71-016	02		Applicable Power plant. Secondary air door -To replace ADC time delay slave relay
SB 71-016	03		Applicable Power plant. Secondary air door -To replace ADC time delay slave relay

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
SB 71-016	04		Applicable Power plant. Secondary air door -To replace ADC time delay slave relay
SB 71-016	05		Applicable Power plant. Secondary air door =To replace ADC time delay slave relay
SB 71-016	06		Applicable Power Plant. Secondary Air Door -To replace ADC Time Delay Slave Relay
SB 71-017			Embodied Power plant -Air intakes -To change the type of strain relief of the HTMA plug at the electrical disconnect box in the ramp void area.
SB 71-017	01		Embodied Power plant. Air intakes - To change the type of strain relief to the HTMA plug at the electrical disconnect box in the ramp void area
SB 71-017	02		Embodied Power plant -Air intakes -To change the type of strain relief of the HTMA plug at the electrical disconnect box in the ramp void area.
SB 71-017	03		Applicable Power plant -Air intakes -To change the type of strain relief of the HTMA plug at the electrical disconnect box in the ramp void area.
SB 71-018			Not applicable
SB 71-019			No effect Power plant. Twin secondary nozzle -To record the introduction of SNECMA/OLYMPUS Mod.28209 (Introduction of lateral heat-shields)
SB 71-019	01		No effect Power plant. Twin secondary nozzle -To record the introduction of SNECMA/OLYMPUS Mod.28209 (Introduction of lateral heat-shields)
SB 71-020			No effect Power plant -Mounts -To provide clearance between "Y" restraint and tantalum under-wing shield

SERVICE BULLETIN LIST

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
SB 71-020	01		Applicable Power Plant. Mounts - To provide clearance between 'Y' restraint and tantalum under-wing shield
SB 71-021			No effect Power plant fireseals -To increase the number of attachment points between the tantalum shield and its durestos backing - Centre wall torching flame shield
SB 71-021	01		No effect Power plant fireseals -To increase the number of attachment points between the tantalum shield and its durestos backing - Centre wall torching flame shield
SB 71-021	02		No effect Power Plant. Fireseals - To increase the number of attachment points between the tantalum shield and its Durestos backing - Centrewall Torching Flame Shield
SB 71-022		Nov 30/78	Embodied Power plant -Intake hydraulic system -To introduce ligatures to certain hydraulic pipes to prevent pipe vibration
SB 71-022	01		Embodied Power plant -Intake hydraulic system -To introduce ligatures to certain hydraulic pipes to prevent pipe vibration
SB 71-022	02		Embodied Power plant -Intake hydraulic system -To introduce ligatures to certain hydraulic pipes to prevent pipe vibration
SB 71-023		Nov 30/76	Embodied Power plant -Spill door actuation -To delete the vane lock mechanism
SB 71-023	01		Embodied Power plant -Spill door actuation -To delete the vane lock mechanism
SB 71-024			Not applicable
SB 71-024	01		Not applicable
SB 71-024	02		Not applicable
SB 71-025			No effect Power plant -Intake control system -To introduce a revised standard of air intake control unit

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SERVICE BULLETIN LIST

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
SB 71-025	01		No effect Power plant -Intake control system -To introduce a revised standard of air intake control unit
SB 71-025	02		No effect Power plant -Intake control system -To introduce a revised standard of air intake control unit
SB 71-027			Applicable Power plant -Secondary air doors -To change "Lock open" signal from U/C down lock relay to U/C weight relay
SB 71-027	01		Applicable Power plant -Secondary air doors -To change "Lock open" signal from U/C down lock relay to U/C weight relay
SB 71-028			No effect Power Plant. Heat Shields -to introduce reinforcing ferrules to underwing heat shields
SB 71-029		Feb 28/77	Embodied Power plant. Ramp actuation -to introduce improved ramp link dust covers
SB 71-029	01		Embodied Power plant. Ramp actuation -to introduce improved ramp link dust covers
SB 71-029	02		Embodied Power plant. Ramp actuation -to introduce improved ramp link dust covers
SB 71-030			No effect Power plant. Heatshields -To introduce a revised cornice heatshield.
SB 71-030	01		Applicable Power plant. Heatshields -To introduce a revised cornice heatshield.
SB 71-031			No effect Power plant -Secondary air doors -Flexible drive shafts lubrication evaluation
SB 71-032		May 30/77	Embodied Power plant -Air intakes -To wire-lock coupling nuts of 'HTMA' electrical connectors in engine bay air intakes
SB 71-033			Not applicable
SB 71-034		Nov 30/77	Embodied

SERVICE BULLETIN LIST

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
			Power plant -Nacelle flame shields -To introduce a new type of riveted grommet and add identification labels to the engine disconnect electrical connectors
SB 71-034	01		Embodied Power plant -Nacelle flame shields -To introduce a new type of riveted grommet and add identification labels to the engine disconnect electrical connectors
SB 71-035		Aug 30/77	Embodied Power plant -Intake rings -To introduce forward intake ring assemblies with Nimonic rubbing strips to overcome sealing ring wear
SB 71-035	01		Embodied Power plant -Intake rings -To introduce forward intake ring assemblies with Nimonic rubbing strips to overcome sealing ring wear
SB 71-036			No effect Power plant -Heat shields -To introduce on additional inspection of the forward under-wing heatshield
SB 71-036	01		Applicable Power plant -Heat shields -To introduce on additional inspection of the forward under-wing heatshield
SB 71-037		Nov 30/78	Embodied Power plant. Heatshields -To introduce inspections and the rework of secondary cup heatshields and the forward firewall panels (underwing panels) to prevent damage to engine bay hydraulic pipes
SB 71-038		Nov 30/78	Embodied Power Plant. Heatshields - To introduce redesigned secondary cup heatshields for forward engine bay hydraulic pipes.
SB 71-038	01		No effect Power plant. Heatshields - To introduce redesigned secondary cup heatshields for forward engine bay hydraulic pipes
SB 71-038	02		Embodied Power plant. Heatshields - To introduce redesigned secondary cup heatshields for

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
			forward engine bay hydraulic pipes
SB 71-039			Applicable Power plant -Inspection of fuel filter outlet to tube junction, tube part No.B489188 for fretting and clearance
SB 71-040			Applicable Powerplant : Secondary air doors-To introduce flexible drive shafts lubricated with "ROYCO" 10 grease
SB 71-041		Feb 28/78	Embodied Hydraulics : No's 2 and 4 intakes -To minimise pipe failures between main filters and selector valves
SB 71-042			Applicable Power Plant. Engine Bays No.2 and 4- To eliminate interaction between Ground Cooling Flap Actuator cable and engine dressing hydraulic pipe.
SB 71-042	01		Applicable Power Plant. Engine Bays No.2 and 4- To eliminate interaction between Ground Cooling Flap Actuator cable and engine dressing hydraulic pipe.
SB 71-043			Applicable Powerplant: Air intake system-To introduce modified air intake control units
SB 71-043	01		Applicable Powerplant: Air intake system-To introduce modified air intake control units
SB 71-044			Applicable Powerplant : Engine bay ventilation flap actuator
SB 71-045			Applicable Power Plant. Secondary Air Doors -To fit an alternative type of control switch at the 3rd C.M.'s station.
SB 71-045	01		Embodied Power plant. Secondary air doors - To fit an alternative type of control switch at the 3rd C.M.'s station
SB 71-046		Nov 30/80	Embodied Power Plant. Hydraulic Pipe Clamp Blocks - To introduce improved mounting half bushes
SB 71-046	01		No effect

SERVICE BULLETIN LIST

	SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
				Power Plant. Hydraulic pipe clamp blocks - To introduce improved mounting bushes
	SB 71-047			No effect
				Power plant. Secondary heatshields 'Y' restraint - To introduce strengthened forward cover
	SB 71-048			No effect
				Engine Air Intakes. Ramp Actuation - Check of bolt through actuator trunnion block
	SB 71-049			Applicable
				Power Plant. Air Intake - To introduce a modified manual control panel
	SB 71-050			Not applicable
	SB 71-052		Feb 28/79	Embodied
				Power Plant. Centrewall - To improve sealing of access panel HZ
	SB 71-052	01		Applicable
				Power Plant. Centrewall - To improve sealing of access panel HZ
	SB 71-053			Applicable
				Power Plant. Air Intakes - To introduce ramp resolver packs incorporating alternative resolvers
	SB 71-053	01		No effect
				Power Plant. Air Intakes - To introduce ramp resolver packs incorporating alternative resolvers
R	SB 71-053	02		No effect
				Power Plant. Air Intakes - To introduce ramp resolver packs incorporating alternative resolvers
	SB 71-054			No effect
				Power Plant. Spill Door Jack Actuation - To reduce the risk of jamming of Spill Door Jack Change-over and By-pass Valve Assemblies
	SB 71-054	01		No effect
				Powerplant. Spill door actuation - To introduce a spill door jack with modified changeover and bypass valve assemblies
	SB 71-055			Applicable
				Power Plant. Secondary Air Doors - To introduce flexible drive shafts lubricated with Aeroshell 16 grease

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SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
SB 71-056			No effect Power Plant. Heatshields - To introduce rein forced forward underwing heatshields, engine bays 1,2,3 & 4.
SB 71-057			Applicable Power Plant. General - To introduce engines to 610 standard incorporating OLY Modifica- tion 8525 and a new standard of HP shut-off Valve cable support rail
SB 71-057	01		Applicable Power Plant. General - To introduce engines to 610 standard incorporating OLY Modifica- tion 8525 and a new standard of HP shut-off Valve cable support rail
SB 71-058			Applicable Power Plant. Heatshields - To delete the heatshields from the forward engine mounting links
SB 71-059			Not applicable
SB 71-061			No effect Power Plant - Air Conditioning and Air Bleed Ports - To specify reduced torque value and to introduce Aeroshell 8 graphite grease for installing Nimonic 80A bolts.
SB 71-062			No effect Powerplant, Air Intake Control Units - Provision of Descrete Altitude switching signals for use of Turbo Pump Inhibition control system
SB 71-063			Not applicable
R SB 71-064			No effect Power plant engine bays. To prevent damage to fuel recirculation and hydraulic pipes mounted on nacelle centre wall in engine bays 2 and 4
R SB 71-065			No effect Power plant general - Introduction of redesigned ball-ended support links. Nozzle control pipes
SB 71-066			Not applicable
SB 71-067			Not applicable
SB 71-068		Nov 30/80	Embodied Powerplant. Ramp actuation - To provide a locking device for front and rear ramp

SERVICE BULLETIN LIST

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
			actuator link housing retaining nuts
SB 71-068	01		Embodied Powerplant. Ramp actuation - To provide a locking device for front and rear ramp actuator link housing retaining nuts
SB 71-069			No effect Nacelles. Engine air intake - To introduce strengthened spring plates. Rear ramp top seal support
SB 71-070			No effect Power plant. Mounts - To modify engine trunnion bearing housings and associated locking pins
SB 71-070	01		No effect Power plant. Mounts - To modify engine trunnion bearing housings and associated locking pins
SB 71-071			No effect Power plant. Ramp actuation - To introduce improved ramp actuator seals
SB 71-075			Embodied Power Plant Engine Bay - To introduce stainless steel/zirconia heatshields
SB 71-076			Embodied Power Plant Engine Bay - To provide fusible wire over temperature indicators for heatshields
SB 71A026			Embodied Power Plant - Secondary air doors - Replacement of screw jack eye-ends
SB 71A051			No effect Power Plant. Intake loading resulting from engine overfuelling surge
SB 71A060			Applicable Power Plant - Inspection of engine nozzle vane abutment segment securing bolts and adjacent zones
SB 71A060	01		Embodied Power Plant - Inspection of engine nozzle vane abutment segment securing bolts and adjacent zones.

SERVICE BULLETIN LIST

	SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
R	SB 71A074			Applicable Power Plant - Heatshields - To introduce additional inspections of the torching flame (Tantalum) heatshields
R	SB 71A074	01		Applicable Power Plant - Heatshields - To introduce additional inspections of the torching flame (Tantalum) heatshields
R	SB 71A074	02		Applicable Power Plant - Heatshields - To introduce additional inspections of the torching flame (Tantalum) heatshields
R	SB 71A074	03		Applicable Power Plant - Heatshields - To introduce additional inspections of the torching flame (Tantalum) heatshields
R	SB 71A074	04		Applicable Power Plant - Heatshields - To introduce additional inspections of the torching flame (Tantalum) heatshields
R	SB 71A074	05		Applicable Power Plant - Heatshields - To introduce additional inspections of the torching flame (Tantalum) heatshields
R	SB 71A074	06	Mar 31/98	Embodied Power Plant - Heatshields - To introduce additional inspections of the torching flame (Tantalum) heatshields
R	SB 26-014		Mar 31/98	Fire Protection - Detection - Replacement of the UV Torching Flame Detection System by extending the existing Firewire Detection System

CHAPTER 71

POWER PLANT

TABLE OF CONTENTS

POWER PLANT - DESCRIPTION AND OPERATION

1. General (Ref. Fig.001, 002 and 003)

   A. Introduction

   The aircraft obtains its thrust from four power plants grouped in pairs, each pair in a nacelle secured to the bottom surface of the wings. The power plants are designated Nos.1 to 4 from left to right. Each has a variable geometry air intake, a twin spool axial flow turbojet engine and a two stage variable exhaust system.

   The nacelles are secured to the wings by a system of freely moving fail safe links and located at the front and centre by fixed attachment points (Ref. 54-00-00). A nacelle comprises a twin intake unit, two engine bays separated by a centre wall and a twin secondary nozzle (TSN). Each engine bay is enclosed by front and rear doors, the front door overlaps the rear and must be opened first.

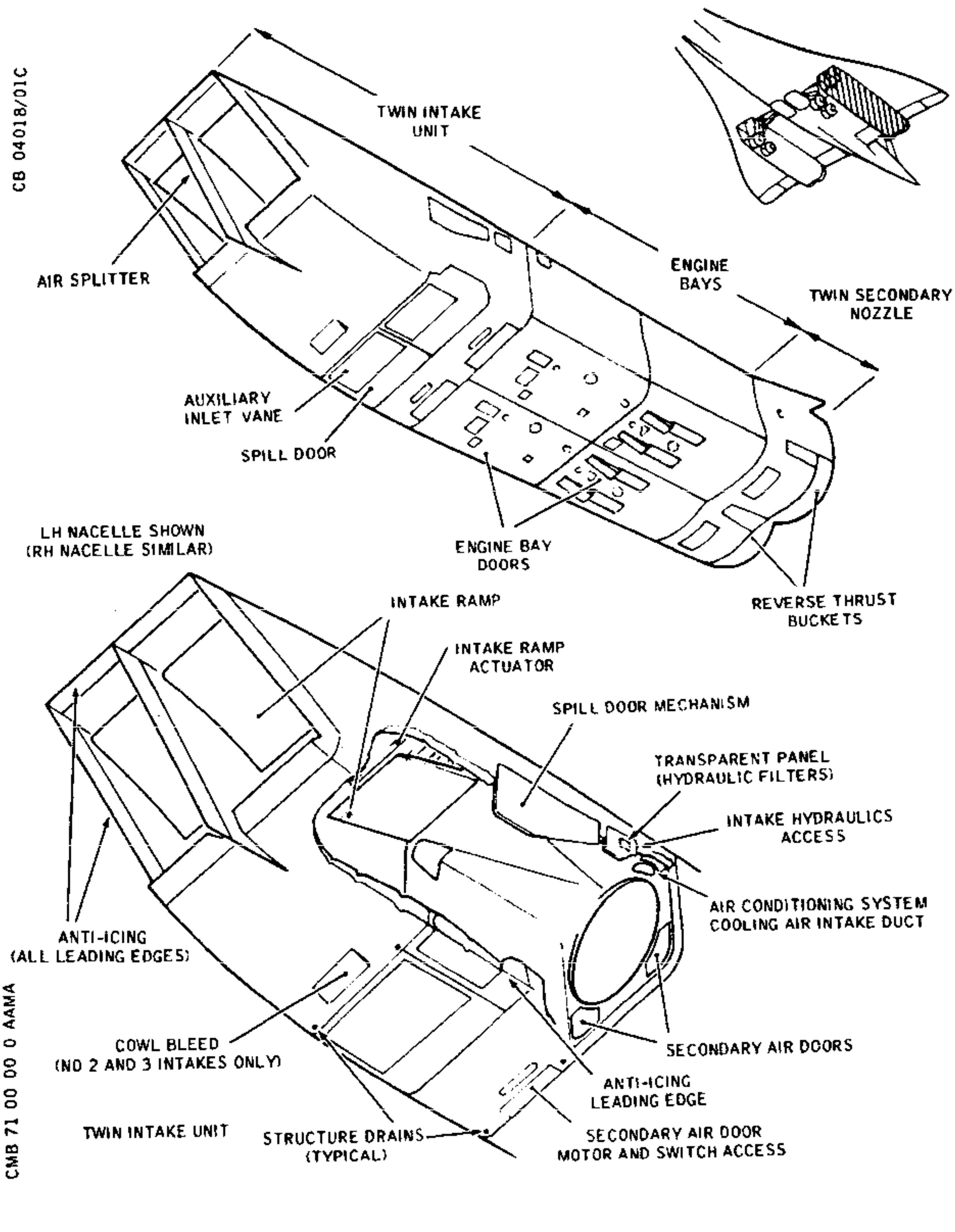
   B. Airflows

   Each engine is contained within a ventilated and cooled area. There are two main airflows (Ref. Fig.002), primary and secondary. Primary air, which is the bulk of the air entering the intake, passes through the engine and exhaust. Secondary air ventilates the engine bay. It is bled off the primary airflow in the air intake at the ramp void, flows through ducting, cascades in the intake internal structure and then through secondary air doors, into the engine bay and along the outside of the engine to mix with the engine exhaust gas downstream of the primary nozzle.

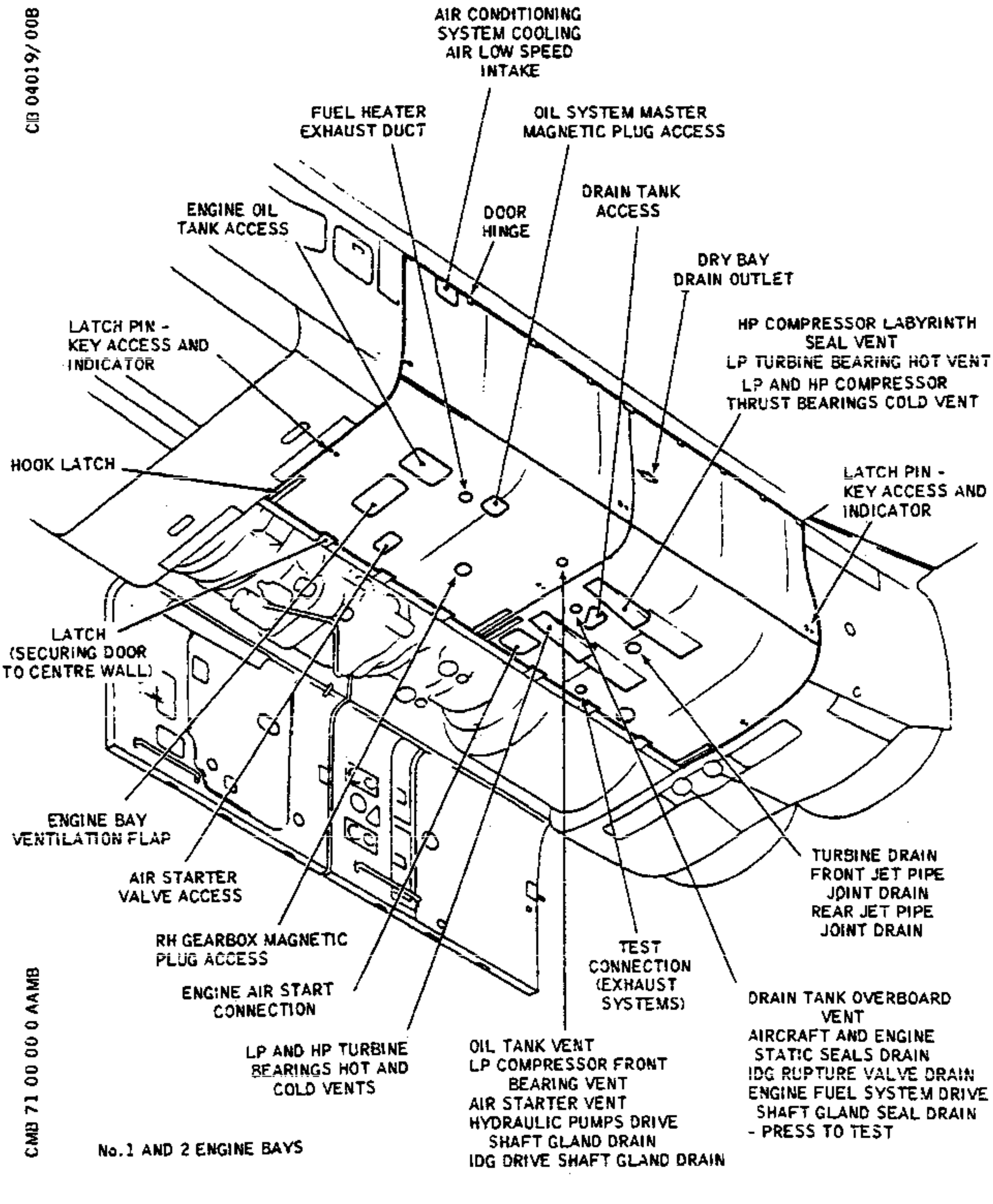
   In addition to the primary and secondary air, tertiary air is drawn from the atmosphere and enters the secondary nozzle through openings forward of the reverse thrust buckets which also form the variable secondary nozzle. Its purpose is to increase the efficiency of the secondary nozzle at low speed.

   C. Nacelle Seals

   The nacelles are gas sealed between the intake and wing at the edges of the engine bay doors and where the forward face of the twin secondary nozzle abuts the wing and rear centre wall. The centre wall is sealed at its joints and where services pass through the wall. In addition all nacelle access panels have seals.



Power Plant Layout (Sheet 1 of 4)
R Figure 001



Power Plant Layout (Sheet 2 of 4)
R Figure 001

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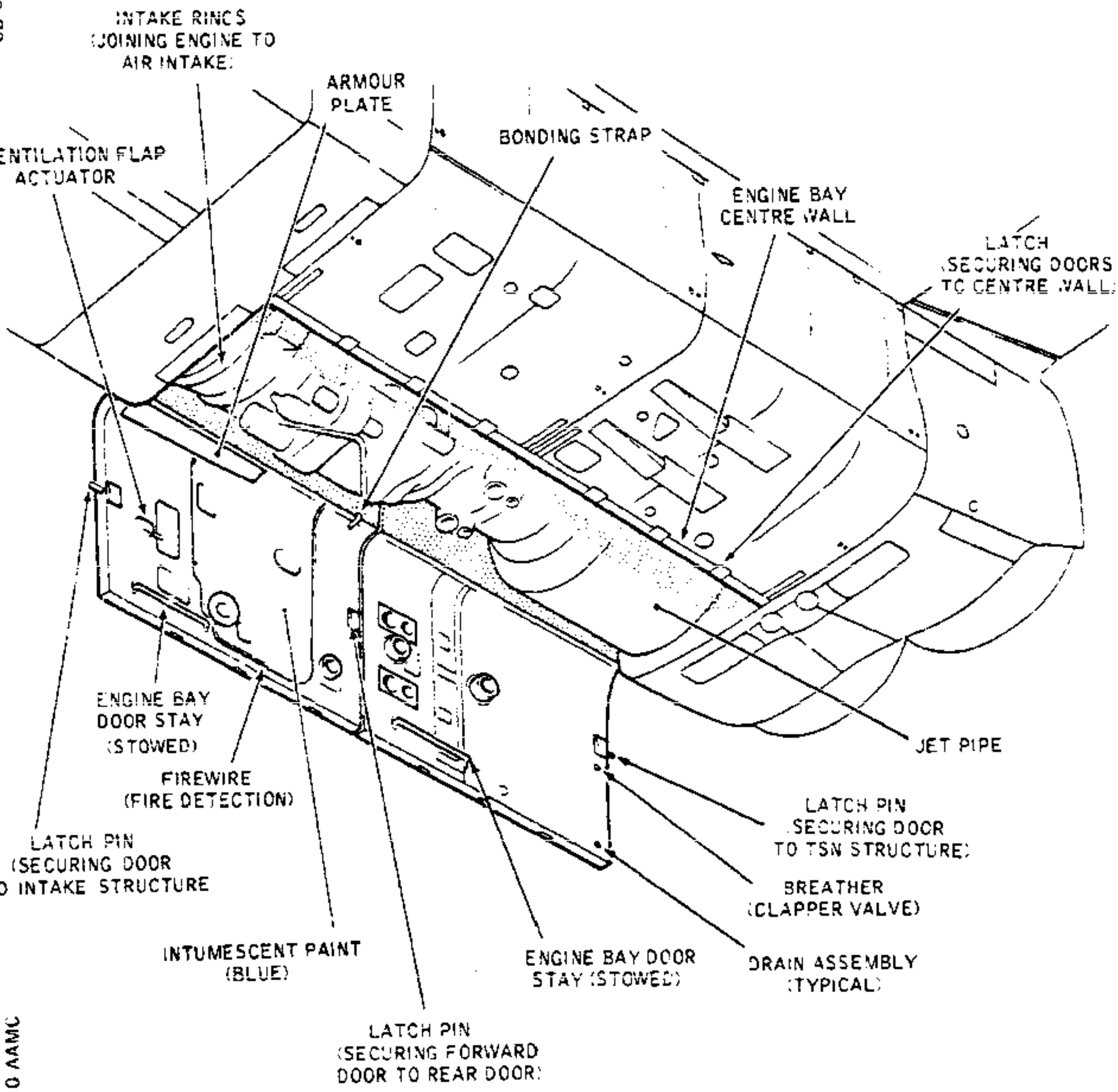
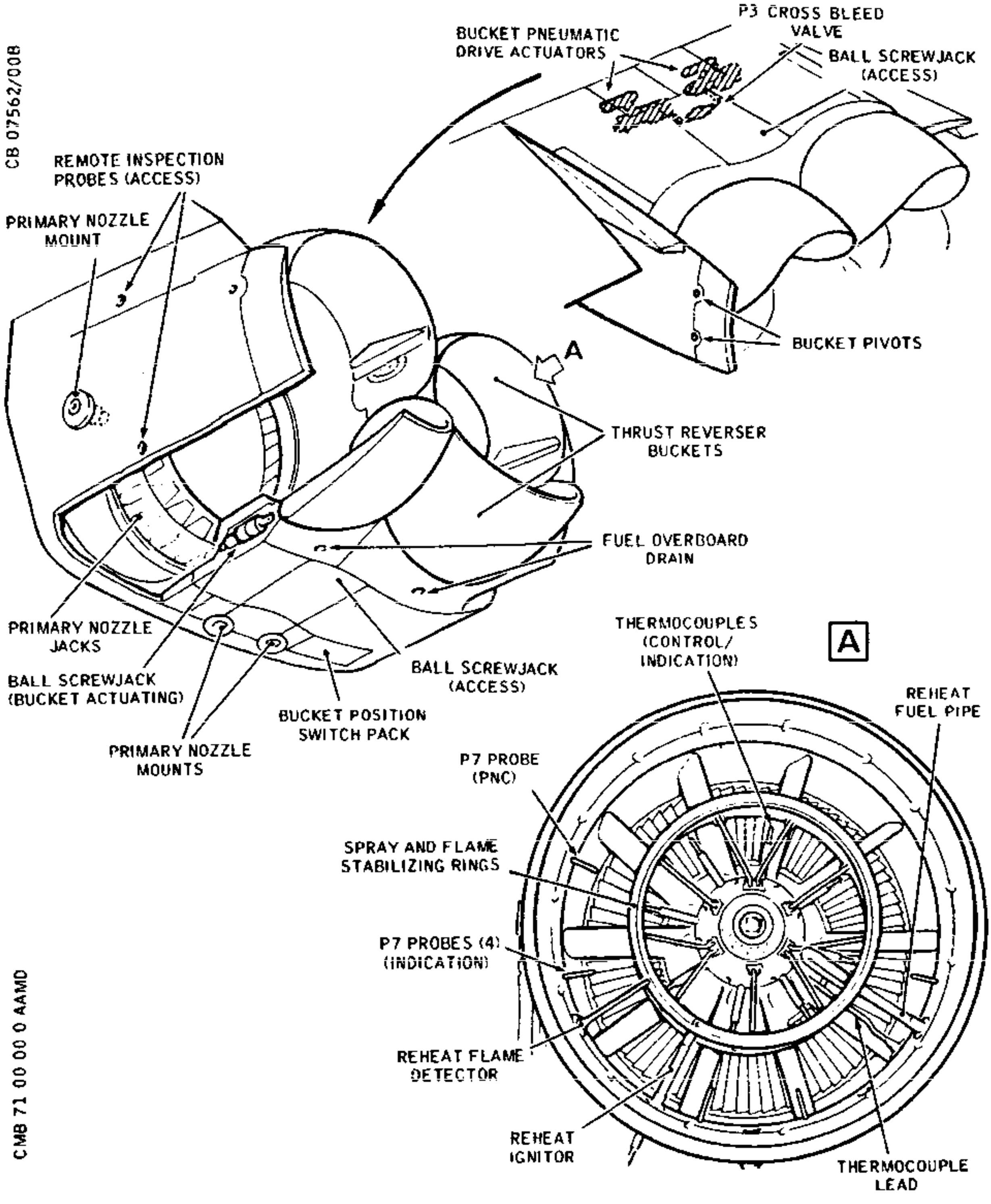


No.1 AND 2 ENGINE BAYS

CMB 71 00 00 0 AAMC

Power Plant Layout (Sheet 3 of 4)
Figure 001

R



Power Plant Layout (Sheet 4 of 4)
Figure 001

R

D. Servicing

In general, services to and from the power plant are positioned to facilitate servicing and rapid engine removal and installation. The intake assembly and twin secondary nozzle may also be removed.

E. Fire Protection

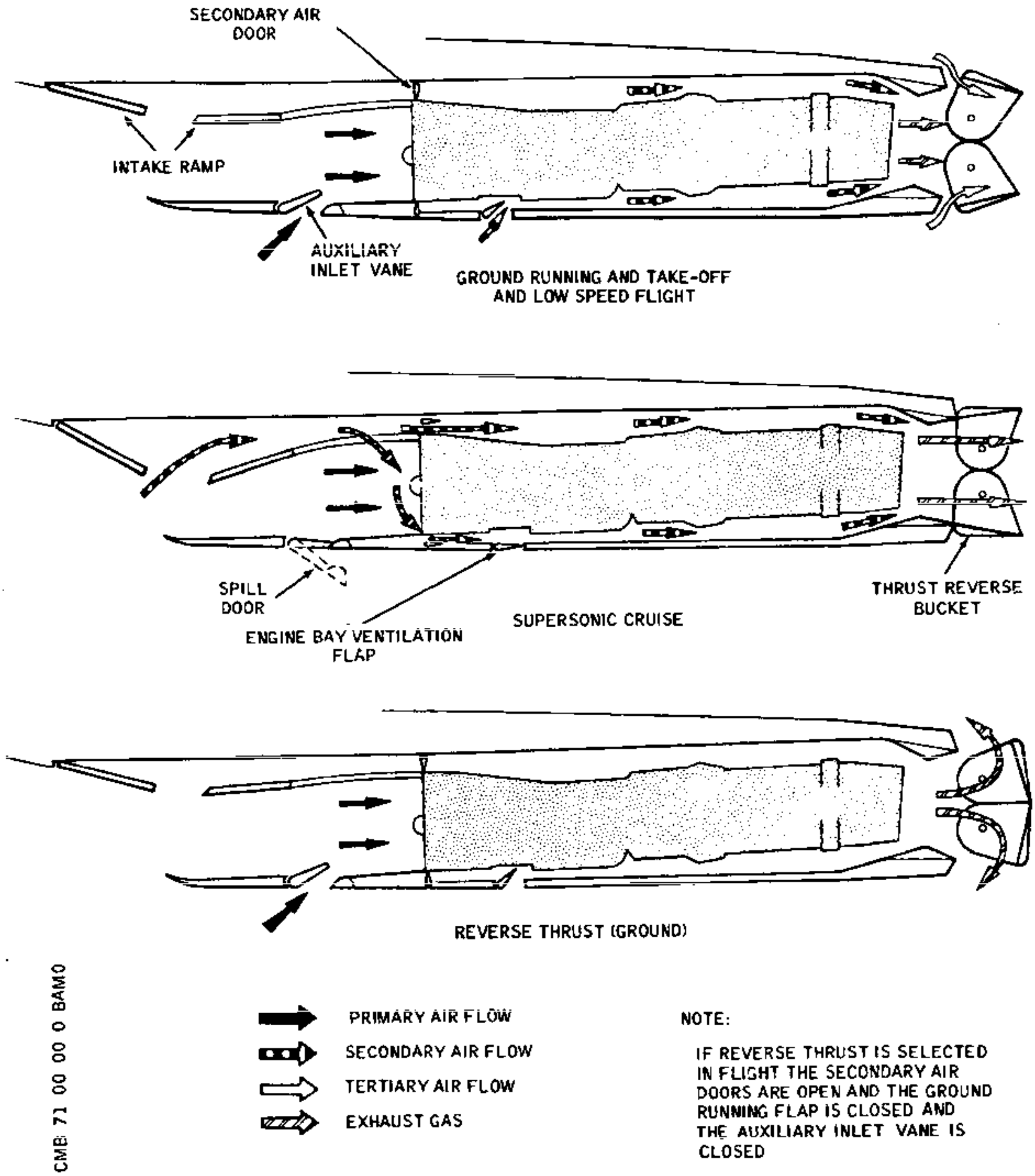
Fire and nacelle overheat detection systems are provided and consist of temperature sensitive loops. The systems are located in the engine bays and illuminate warning lights and captions in the flight compartment. In the event of a fire a manually operated fire extinguisher system discharges an inert gas into the engine bay. The system is operated from engine shut-down handles and pushbuttons on the pilot's roof panel (Ref. 26-00-00). The shut-down handles activate fire flaps which assist in sealing the engine bay before the fire button is pressed and cut off the supply of flammable fluids to the engine bay. Certain parts of the engine bays and intake are coated with intumescent paint which when subjected to heat expands volumetrically to form a protective film.

When an engine shut-down has been activated operationally it will be necessary subsequently to reset the integrated drive generator (IDG) (Ref. 24-11-00) because the IDG will also have been tripped as part of the crew drill.

F. Debris Shields

Titanium armour plate, intended to act as a debris shield to protect vital areas of the aircraft from possible damage should an engine disintegrate, is located above the engines low pressure compressors (LP) in the roof of the engine bay, on the engine bay doors and on rib 12 in the starboard wing.

In the air intake, all the upper surfaces of the diffusers, under the bleed skin have a fibreglass light weight armour debris shield.



NOTE:

IF REVERSE THRUST IS SELECTED IN FLIGHT THE SECONDARY AIR DOORS ARE OPEN AND THE GROUND RUNNING FLAP IS CLOSED AND THE AUXILIARY INLET VANE IS CLOSED

Airflows
Figure 002

2. Engine Air Intakes (Ref. Fig.001)

A. General

The engine air intakes provide optimum mass flow to the engines throughout the operating range. Each intake consists of a knife edged rectangular section which progressively changes to circular section at the engine face. The effective intake area is varied by lowering a hinged ramp from the intake roof, as aircraft speed increases.

The ramp alters intake area in response to commands from an electronic air intake control system (AICS), which also controls an outward opening spill door (Ref. 71-61-00). The ramp and spill door are complementary, each is operated by a hydraulic actuator in the intake hydraulic system which is an integral part of the aircraft hydraulic system (71-62-00). Failure of the main system brings in a standby hydraulic system.

B. Air Intake and Bleeds

On the ground or in low speed flight an auxiliary inlet vane in the spill door opens inwards aerodynamically to form an auxiliary engine air intake. The spill door opens outwards during supersonic flight when the ramp is fully lowered or when air temperature or throttling conditions dictate, to spill air in excess of engine demand.

The air intakes to numbers 2 and 3 engines have perforated (cowl) bleeds to improve intake performance of high aircraft mach numbers.

C. Anti-icing

Inside each main air intake located just forward of the engine face is a cooling air intake for the air conditioning system. This is the high speed intake, the corresponding low speed intake being in the forward engine door.

The lips of the main and auxiliary air intakes (Ref. 54-21-00), and the air conditioning cooling air intake leading edge (Ref. 54-11-11), are protected by electric anti-icing heating elements which are particularly vulnerable to damage if not protected during servicing. Some of the elements are cyclical and some are continuous in operation.

D. Fireflaps and Secondary Air Doors

A fireproof bulkhead at the rear of the intake incorporates four secondary air doors which control secondary airflow through the engine bay (Ref. 71-31-00). The drive assembly, screwjacks, motor and indication switch unit are mounted on the forward face of the bulkhead in an area which would be sealed from an engine fire. The doors are shut at low airspeed and on the ground by a signal from the air data computer. The doors also form part of the fire flaps system. Intumescent paint on the door fittings helps to seal the bulkhead during an engine fire.

E. Servicing

The twin air intake unit may be removed and installed without disturbing the engines (Ref. 54-00-00). The intake units are not interchangeable.

To prevent foreign object damage (F.O.D.) it is of the utmost importance that a high standard of cleanliness is observed during servicing tasks in the air intake. The guidelines for intake entry/exit are described in 71-00-00, Servicing and supplemented by any warnings or precautions peculiar to the servicing task in hand.

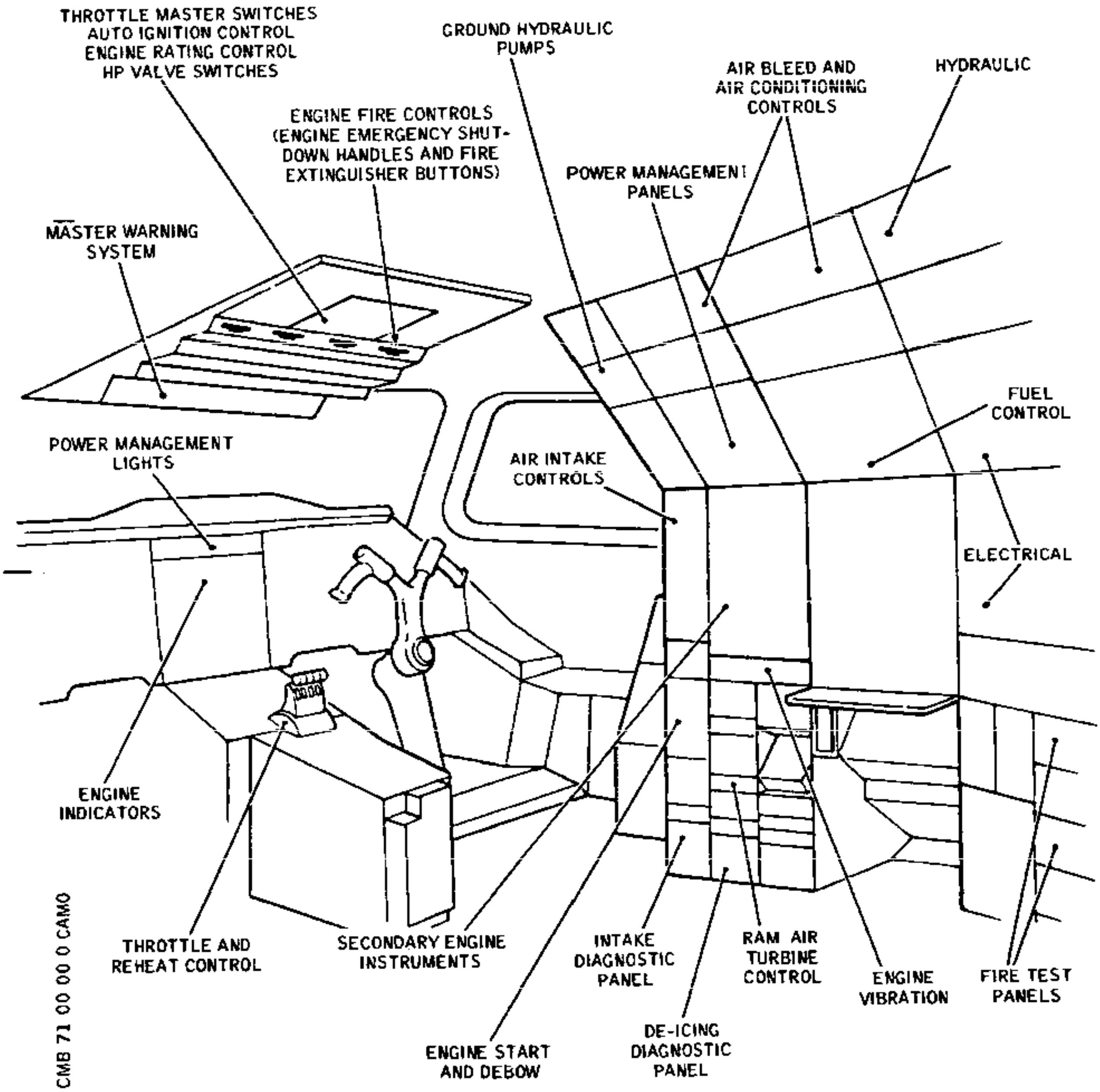
3. Engine and Engine Bay (Ref. Fig.001, 004 and 005)

A. General

Four Olympus type 593-610 engines are installed in the aircraft. The two engines in a nacelle being separated by a centre wall secured to a wing rib fitting. Each engine is electronically controlled in conjunction with a hydro-mechanical system. Reheat is incorporated. The general layout of the controls and indicators is illustrated (Ref. Fig.003).

B. Mounts

The engine is secured in the engine bay by a four point suspension, which permits differential movement of the engine with respect to the engine bay and which transmits engine thrust loads to the wing structure. It is also secured to the engine air intake by intake rings, (Ref. 71-21-11) and coupled by a jet pipe to the primary nozzle mounted in the twin secondary nozzle. The main engine mounts are constructed to 'fail safe'.



Controls and Indicators
Figure 003

C. Centre Wall

The engine bay wall is a two panel structure secured to the wing by fail safe links and braced by diagonal struts.

At the front edge of the wall is a snubber block which will support the rear of the intake in the event of a failure of the intake fitting.

D. Engine Accessories

Two accessory gearboxes on the engine drive an engine mounted integrated drive generator (IDG) to supply a.c. electrical power for aircraft and engine services. An IDG may be disconnected from its generator by operating a NORM/DISC switch at the 3CM position. To reset and IDG it is necessary to open the engine bay doors and operate the manual reset handle (Ref. 24-11-00, Adjustment/Test). A main hydraulic pump is similarly mounted to supply hydraulic power for the aircraft main hydraulic system, and an additional pump is installed on No.2 and 4 engines to supply power for the standby hydraulic system.

E. Power Plant Build-up

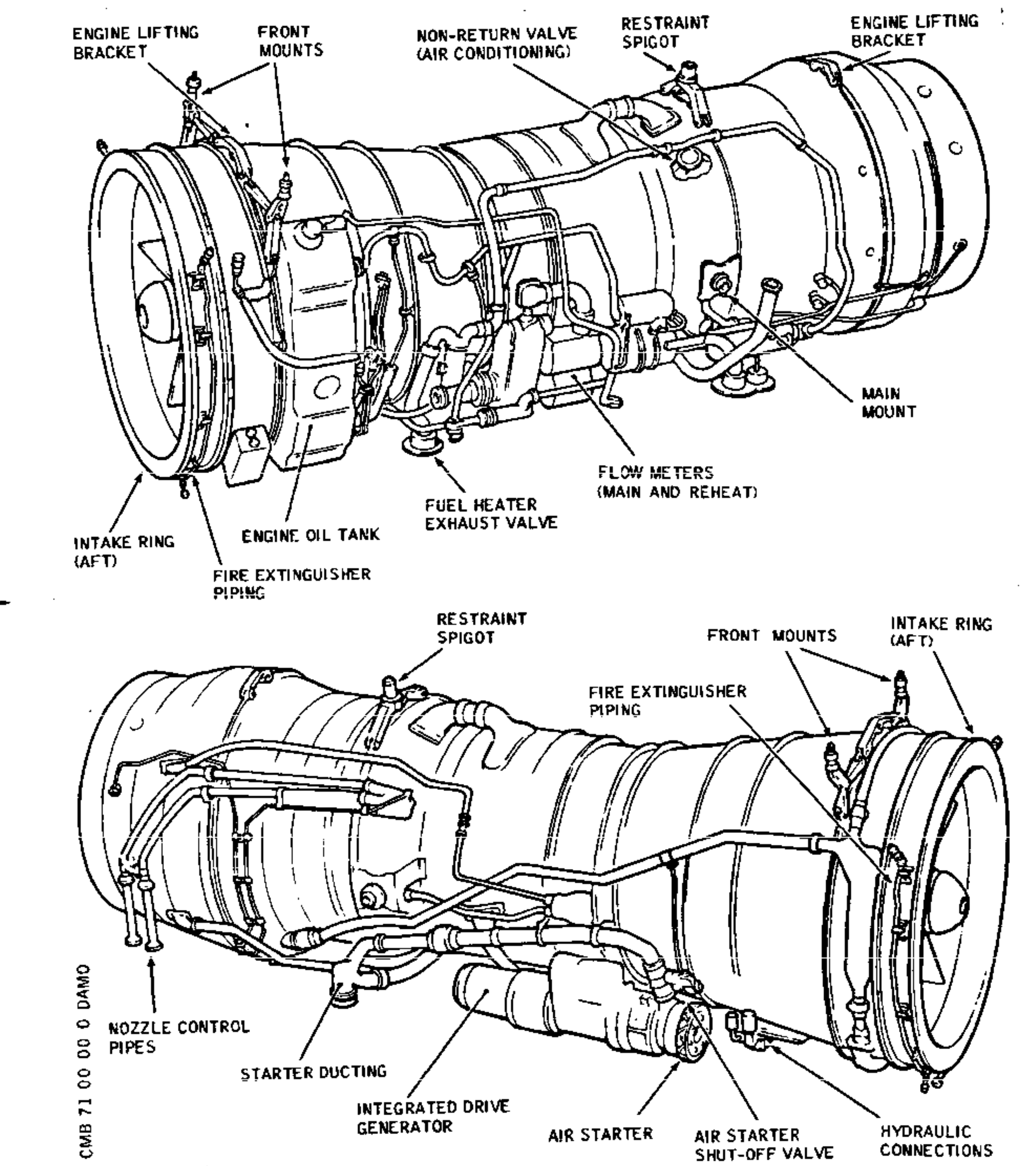
To facilitate a quick engine change, certain components are assembled to the engine during build-up before engine installation (Ref. Fig.004 and 005). Dressed engines can only be installed in specific positions on the aircraft, but engines may be partially dressed to a standard (maximum neutral engine) from which build-up to a specific position may be completed.

F. Electrical Harness

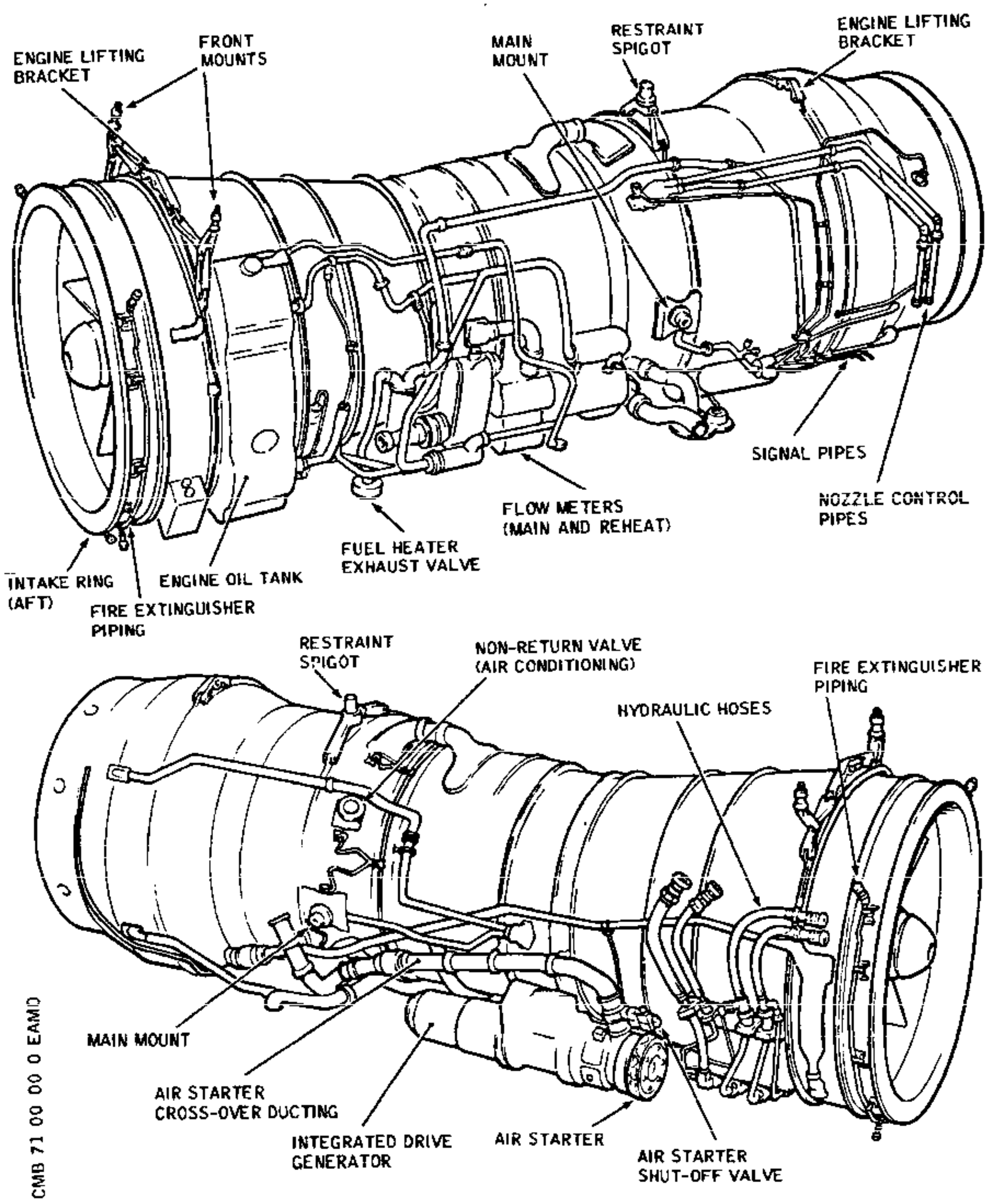
The electrical harness consists of multi-cable looms which connect the engine components to the aircraft. Nine of these R cable looms connect to a forward box on the engine support struts and the remaining four looms connect to a frontier box in the engine bay roof (Ref. 71-51-01).

G. Cooling Air System

Air for the air conditioning charge air system is supplied through ducting and primary and secondary air to air heat exchangers above the engine from the engine HP compressor. The charge air is cooled by air ducted, either from a high speed intake in the main air intake, or from a low speed intake in the forward engine bay door to the heat exchangers (Ref. 21-13-00). From the heat exchangers, the cooling air is discharged through ducts into the jet pipe shroud before joining the exhaust gas.



Engine Build-up Engines 1 and 3
Figure 004



Engine Build-up Engines 2 and 4
Figure 005

H. Starting

Engine starting is effected by an air starter which turns the HP shaft, air being supplied from a ground rig or from an adjacent running engine. During starting, a DEBOW control on the 3CM panel is used to govern HP compressor speed.

J. Heat Shields

Heat shields on the underside of the wing above the engine and on the engine and jet pipe protect the structure against high engine bay temperatures. Individual pipes and electrical looms entering the engine bay from the wing are similarly protected.

After SB 71-076

Fusible temperature sensitive wire is fitted on the firewire sidewall plate to indicate hot air leaks onto the heat shields (Ref. 71-32-17).

K. Door Hinges and Fasteners

The engine bay doors are hinged to the bottom surface of the wing. In the fully open position they give complete access to the engine bays. Each door is also hinged along its lower corner so that, if limited access to the underside of the engine is required, only the lower part of the door need be opened. In the closed position the forward doors and the rear doors are held together and are secured at their extremities, by latch pins, to the intake structure and the TSN structure. Hook latches on the lower part of each door secure the closed doors to the bottom edge of the centre wall. In addition latches on the base of the centre wall secure the closed door to the centre wall.

L. Door Access Panels

The doors are provided with access panels through which most of the routine servicing of the engines can be accomplished. Incorporated in each forward door is an engine bay ventilation flap that is spring biased open to admit cooling air to the engine bay when the secondary air doors are shut.

M. Fireflaps

This flap and the secondary air doors at the forward end of the engine bay are part of the fire flaps system. When activated they shut-off ventilating air to the engine bay and seal it for the fire extinguishing gas. Simultaneously the LP and HP fuel valves, the hydraulic shut-off valve and the air conditioning cross bleed and bleed valves are closed to isolate these services to the affected engine and to prevent fire spreading. Certain other circuits are switched at the same time (Ref. 26-22-00). Parts of the forward engine bay door have a covering of intumescent (blue) paint.

N. Servicing Points and Engine Drains

Servicing points and openings in the forward doors include the access for manual reset of the air starter valve and the access panels for the engine oil tank and right-hand and left-hand gearbox magnetic plugs (Ref. 79-00-00). The fuel heater exhaust duct is the outlet for very hot gases when the engine is running. On the rear edge of the door is a combined vent for the oil tank, LP compressor front bearing and air starter (Ref. 75-00-00), also the same outlet serves as a drain for the hydraulic pumps drive shaft gland and the IDG drive shaft gland (Ref. 71-79-00).

The rear door houses the test connections for ground testing the primary and secondary nozzles and, on engines No.1 and 3 only, the connection for the air start rig. In the centre, forward, is a combined drain for the aircraft and engine static seals, the IDG rupture valve and the engine fuel system drive shaft gland seal press-to-test (Ref. 71-73-00). The drain tank overboard vent utilizes the same outlet. To the rear is a drain tank access panel and rear of that is the hot drain for the turbine, the front jet pipe joint and the rear jet pipe joint. The LP and HP turbine bearings hot and cold vents outlet is the rectangular outlet on the right. A similar outlet on the left vents the HP compressor labyrinth seal, the LP turbine bearing hot vent and the LP and HP compressor thrust bearings cold vent.

P. Engine Bay Drains

A dry bay drain on the rear side panel will give indication of an internal fuel or hydraulic oil leak into this bay. Any leakage should be investigated promptly. In addition both front and rear doors have valve type drains to permit fluids, which may have collected on the doors, to drain to atmosphere.

4. Exhaust System (Twin Secondary Nozzle)

A. General

The exhaust system (Ref. Fig.001) gives optimum propulsion efficiency throughout the operating range. The system comprises an integral twin secondary nozzle assembly located at the rear of the engine bays and secured to the undersurface of the wing by a drag and thrust strut assembly and to the rear of the engine bay centre wall. The mountings are protected by heat shields. Extending into each twin secondary nozzle is a removable, petal type primary nozzle at the rear of each engine. The primary nozzle area is adjusted by an electro-pneumatic system from a trim unit on the rear engine bay centre wall. The primary nozzle control units may be adjusted during engine ground runs and for this purpose the engine bay doors are opened (Ref. 71-00-00, Adjustment/Test).

The twin secondary nozzle is a monoblock structure which incorporates removable thrust reverser clam shell buckets, actuators and components in the reverse bucket control system. It also houses the radial mounting pins for the primary nozzle. Panels are provided for access to the various components in the bucket system and for remote inspection probes which may be used for internal inspection of the stress skin panels and attachments.

B. Drains

To prevent the accumulation of fuel, which would create a fire hazard, a drain system is provided and piped overboard.

C. Secondary Nozzle

The secondary nozzle/thrust reverser buckets are activated by pneumatically powered screwjacks. The secondary nozzle is controlled electrically and when selected, will vary automatically with changes in mach number being fully open before supersonic cruise.

A twin secondary nozzle may be removed as a complete assembly or in various other configurations (Ref. 71-00-13) with the engines installed. The twin secondary nozzles are not interchangeable.

D. Primary Nozzle

Primary nozzles are interchangeable but certain components would need to be repositioned if a nozzle which has been dressed for No.1 engine, for instance, is required for No.2 (Ref. 78-12-01). A primary nozzle may be changed with the engine installed if the reheat jet pipe is first removed (Ref. 78-11-01).

5. Operation (Ref. Fig.002)

A. General

On the ground before starting the engines the intake ramps and spill doors will be fully up and the auxiliary inlet vanes will normally be closed unless they have been disturbed in which case they will return slowly towards the closed position. The engine bay ventilation flap will be open, and the secondary air doors shut and checked as shut as part of the pre-start drill.

The engines are started from an air starter with an air rig, electric ground supply and air conditioning rigs connected to the aircraft (Ref. 71-00-00, Adjustment/Test).

Initially after engine start the ramps and spill doors will remain fully up but the auxiliary inlet vane and engine bay ventilation flaps will be open. The former to admit additional air to the engine and the latter to provide engine bay ventilation and cooling. The secondary air doors will remain closed.

A ground idle system is utilized when taxying to avoid excessive thrust.

During take-off the noise abatement flyover setting, which has been pre-selected on the NASU selector, is obtained by cancelling reheat and reducing the throttles from Max Take-off Power to a pre-set condition indicated by Throttle Lever Angle Indices (Beta lights) on the Nos.1 and 4 throttles and throttle gate. After take-off at low air speed up to M = 1.3 the ramps and spill doors remain fully up but the auxiliary inlet vane closes progressively as intake internal air pressure rises, being fully closed at approximately mach 0.4. The engine bay ventilation flap starts to close at M = 0.3, after the secondary air doors open if the doors are in AUTO.

At higher speeds the ramps and spill doors will move to vary intake area as a function of mass flow, temperature and other governing parameters (Ref. 71-61-00).

In the exhaust, the primary nozzle area will vary as an integral part of the engine control system. The secondary nozzle, when selected will also vary with increase in mach number being fully open at approximately M = 1.1. At low speed the efficiency of the secondary nozzle is improved by introducing tertiary air into the exhaust bay through openings created between the structure and the forward edge of the thrust reverser buckets.

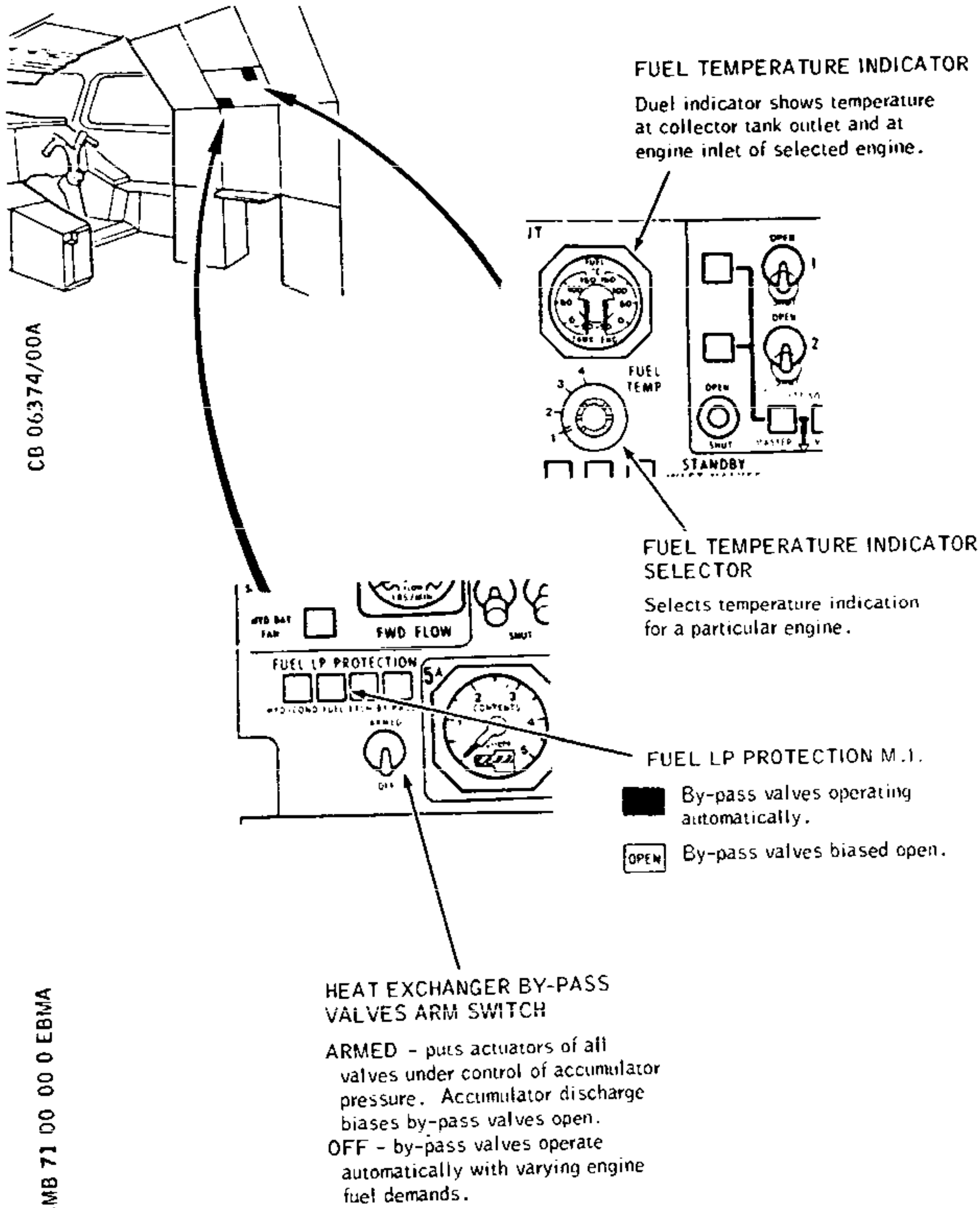
On selection of reverse thrust the secondary nozzle thrust reverser buckets are closed by the action of screwjacks and deflect the exhaust gases forward through approximately 110 - 120 degs. Reverse thrust cannot be selected unless the forward thrust (throttle) lever is at idle (Ref. 78-30-00), and the idle lock tongue is engaged in the throttle gate.

B. Number 4 Power Plant

On number 4 power plant, the intake/engine compatibility is improved during take-off by N1 limitation, selected at the 3CM position. For the same reason secondary air door opening is varied with respect to the other three engines.

6. <u>Power Plant Management</u> (Ref. Fig.006, 007 and 008)
(Ref. Fig.009, 010 and 011)
(Ref. Fig.012 and 013)
(Ref. Fig.014, 015 and 016)
(Ref. Fig.017, 018 and 019)
R (Ref. Fig.021 and 022)

The power plant is managed using the controls and indicators shown in the illustrations. Management details for hydraulics and exhaust systems are to be found in 29-00-00 and 78-00-00 respectively.



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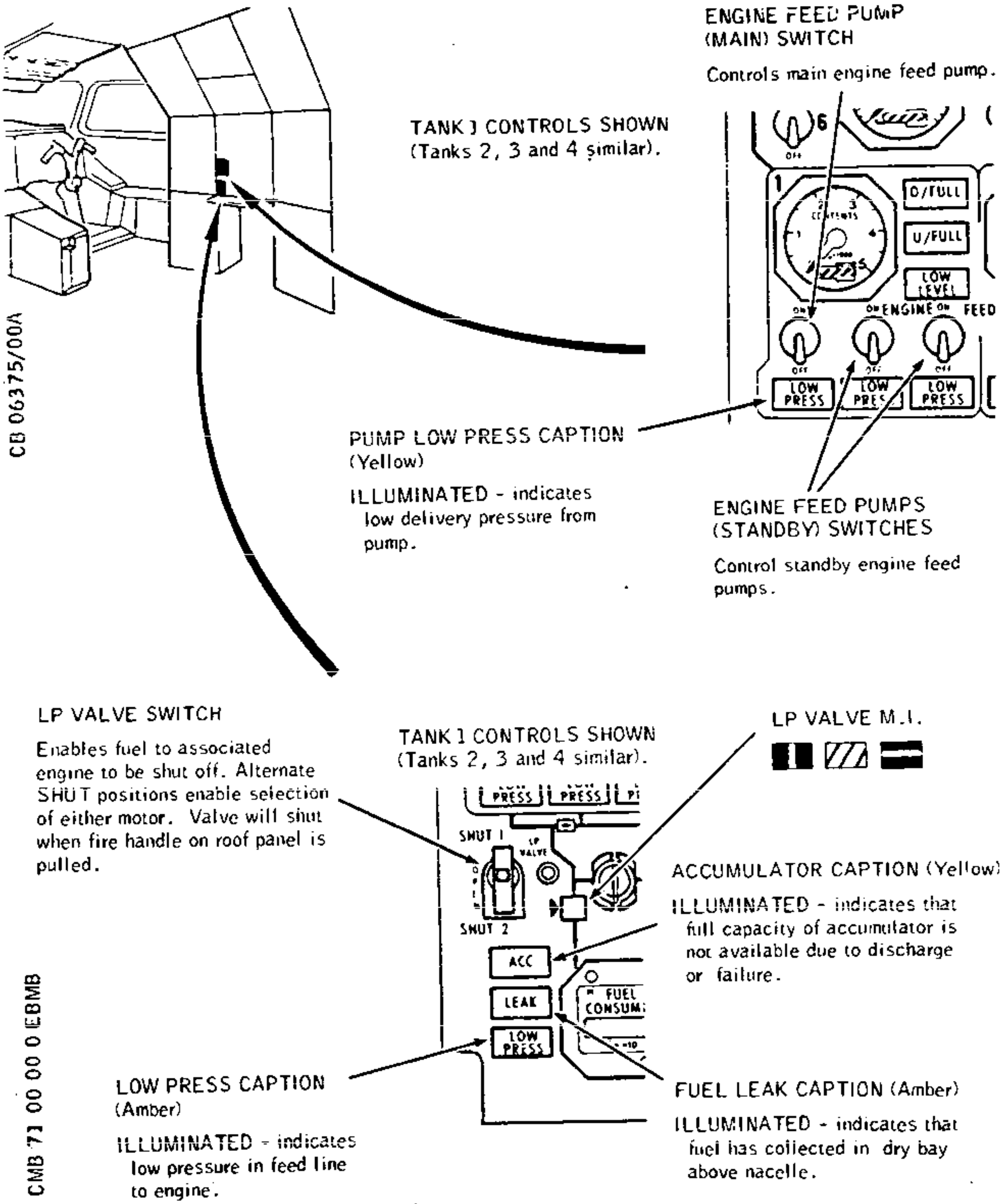
Systems Management - Fuel Sheet 1 of 7
Figure 006



Systems Management - Fuel Sheet 2 of 7
Figure 006

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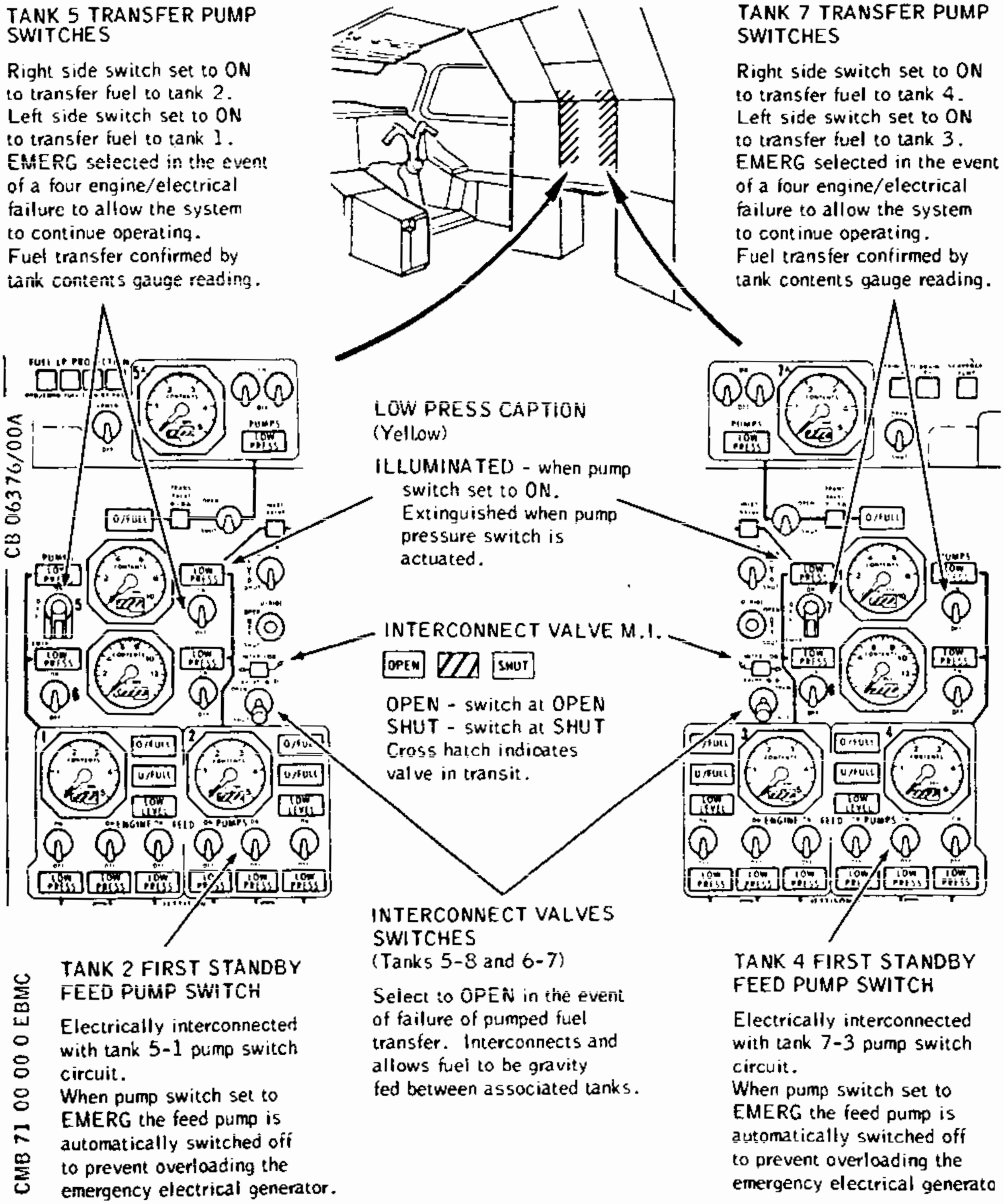

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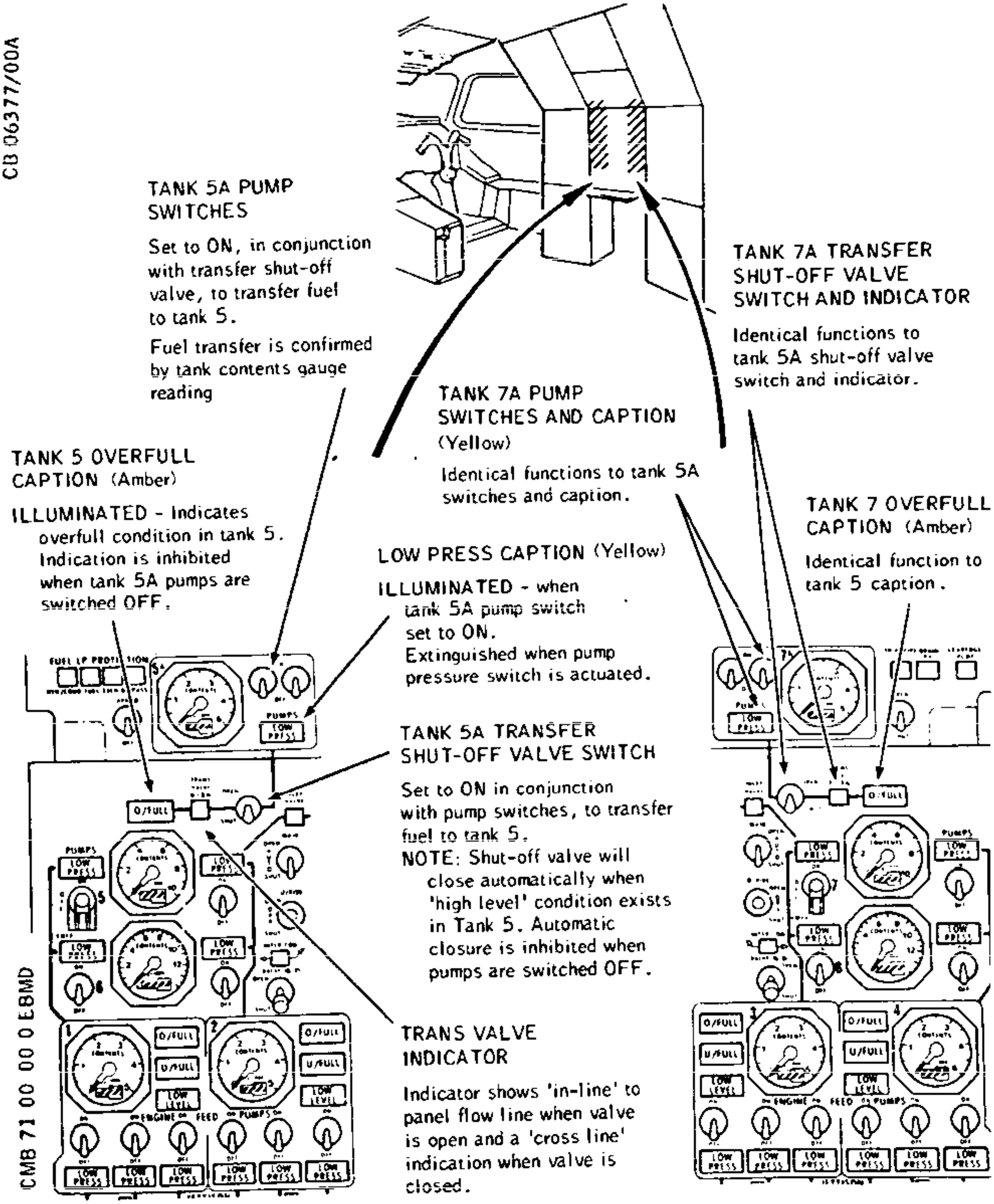
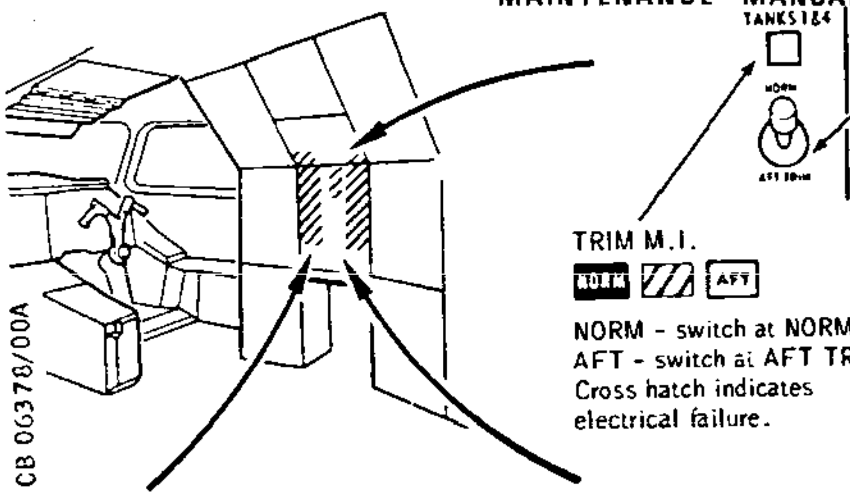
Systems Management - Fuel Sheet 3 of 7
Figure 006



Systems Management - Fuel Sheet 4 of 7
R Figure 006



CB 06378/00A

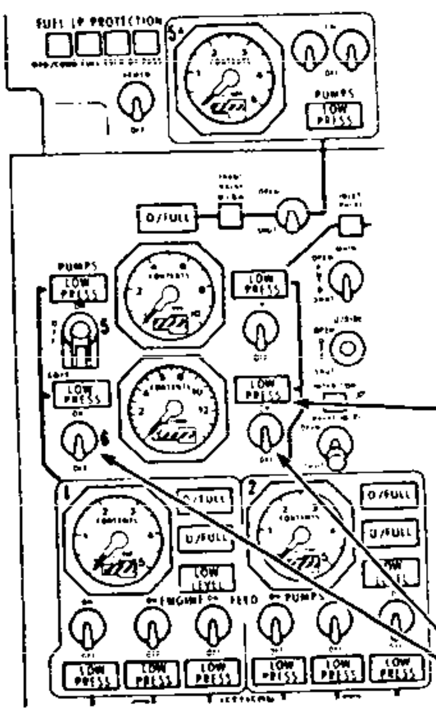
TANK 1 & 4 TRIM SWITCH

Set to AFT TRIM to close solenoid operated shut-off valves in the 'high level' sense lines of the transfer control valves of tanks 1 and 4.
Reduced fuel level sensors in these tanks then control the appropriate fuel level.

TRIM M.I.

NORM / AFT

NORM - switch at NORM
AFT - switch at AFT TRIM
Cross hatch indicates electrical failure.

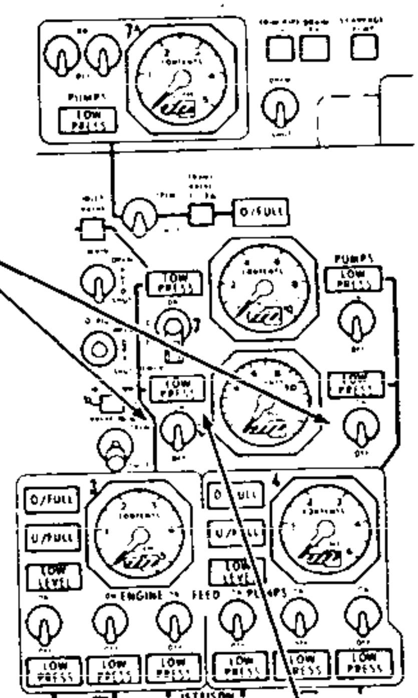


TANK 8 TRANSFER PUMP SWITCHES

Left side switch set to ON to transfer fuel to tank 3.
Right side switch set to ON to transfer fuel to tank 4.
Fuel transfer is controlled by sensor operated control valves and confirmed by tank contents gauge reading.

LOW PRESS CAPTION (Yellow)

ILLUMINATED - when tank 6 pump switch set to ON. Extinguished when pump pressure switch is actuated.



TANK 6 TRANSFER PUMP SWITCHES

Left side switch to ON to transfer fuel to tank 1.
Right side switch set to ON to transfer fuel to tank 2.
Fuel transfer confirmed by tank contents gauge reading.

LOW PRESS CAPTION (Yellow)

ILLUMINATED - when tank pump switch set to ON. Extinguished when pump pressure switch is actuated.

CMB 71 00 00 0 EBME

NOTE:
The transfer control valves regulating fuel transfer between tanks 6-1 and tanks 8-4 are additionally controlled by the tank 1 & 4 NORM/AFT switch to give a reduced level in these tanks.

Systems Management - Fuel Sheet 5 of 7
Figure 006

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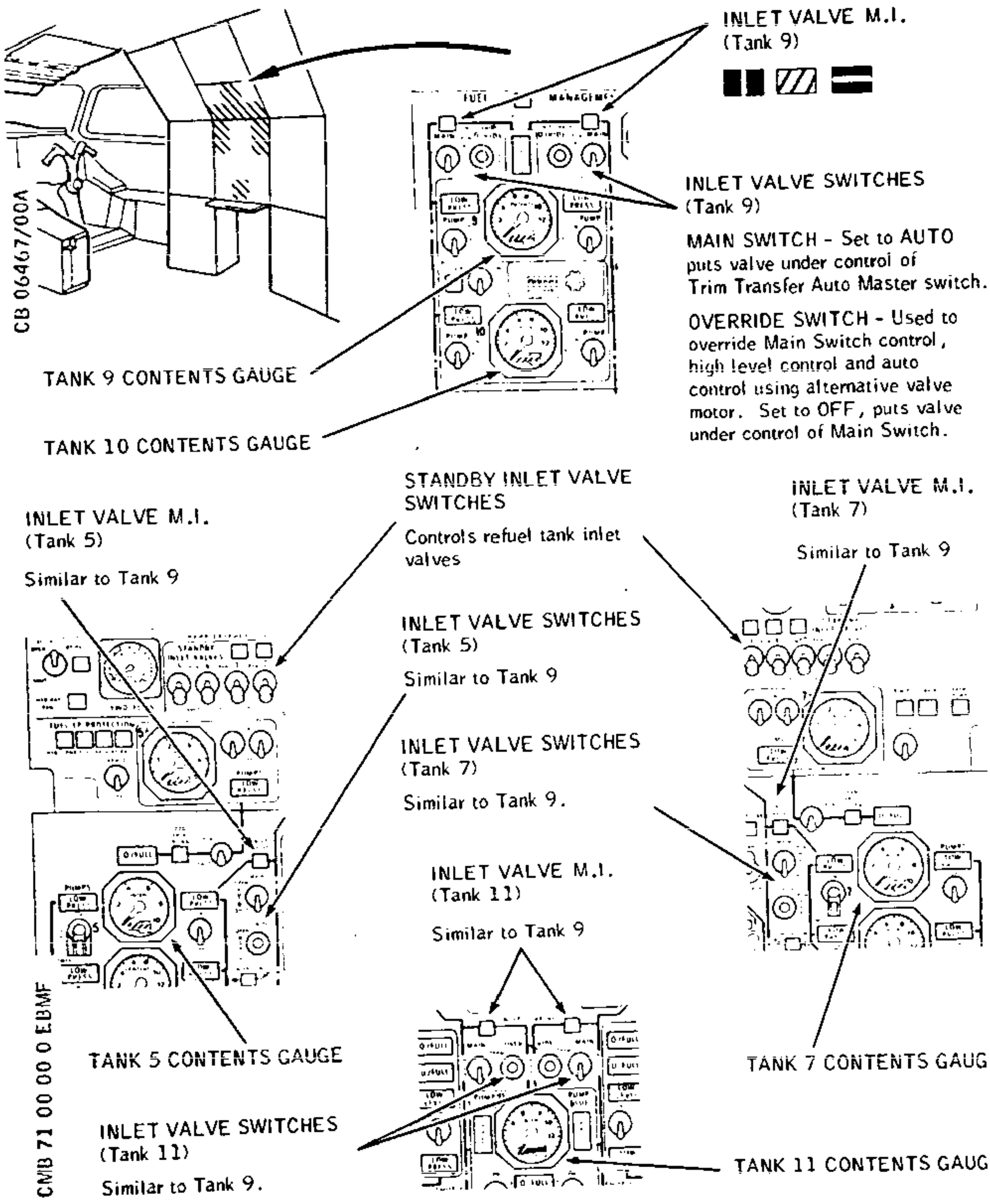

Systems Management - Fuel Sheet 6 of 7
Figure 006

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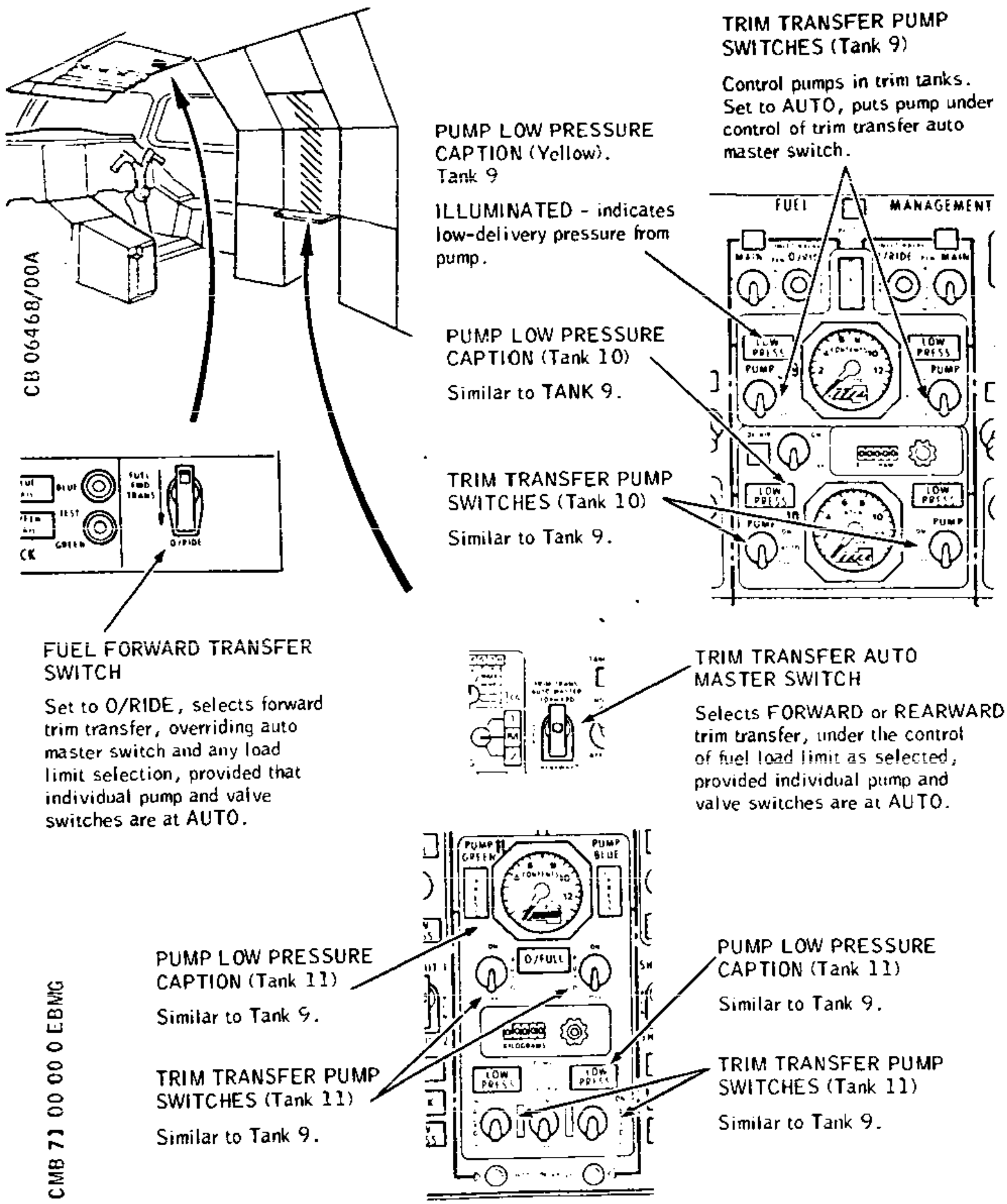
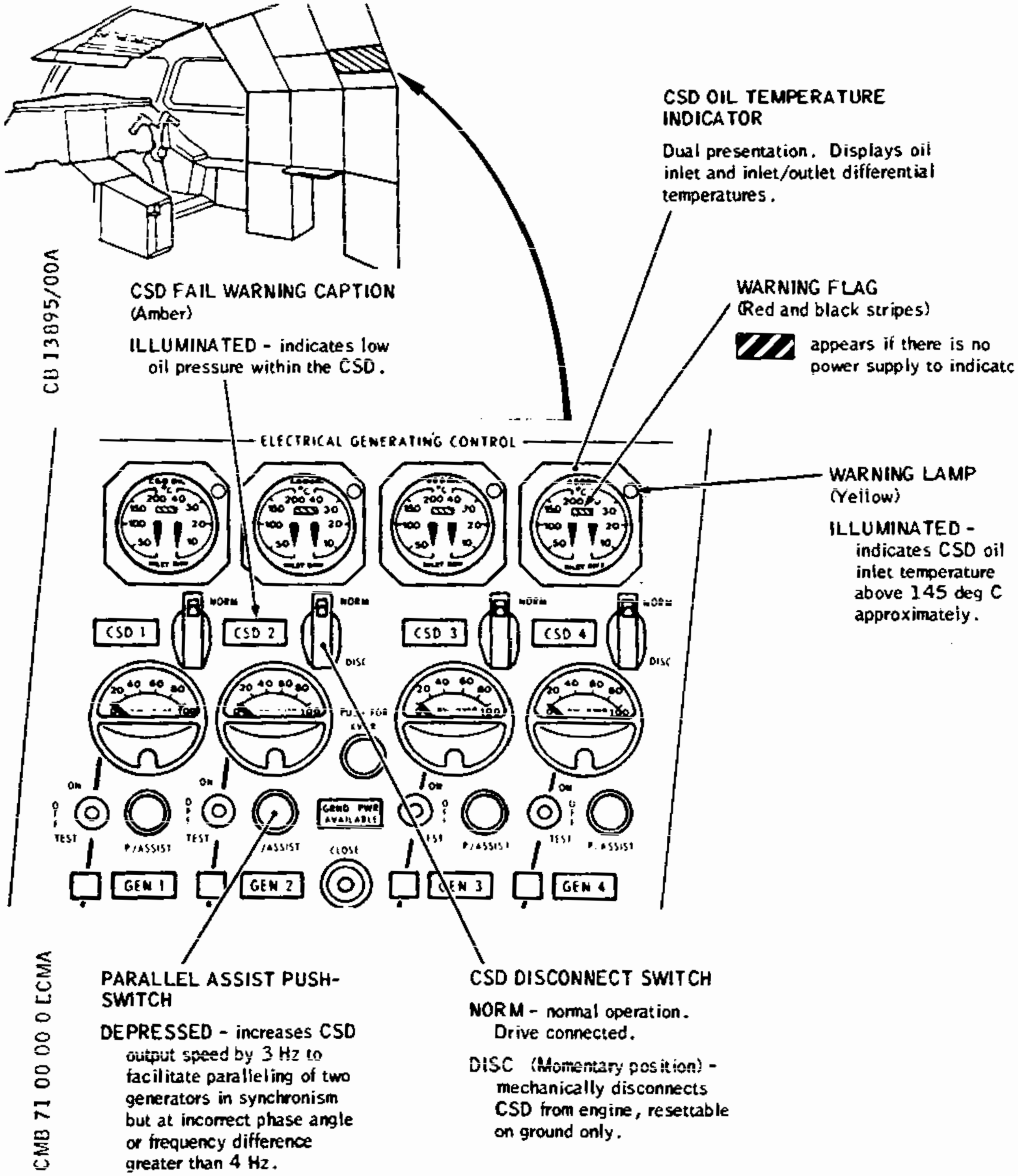


Systems Management - Fuel Sheet 7 of 7
Figure 006



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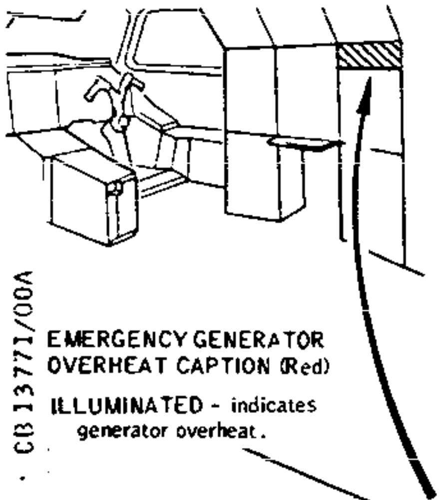
Systems Management - Electrical Sheet l of 4
Figure 007



CB 13771/00A

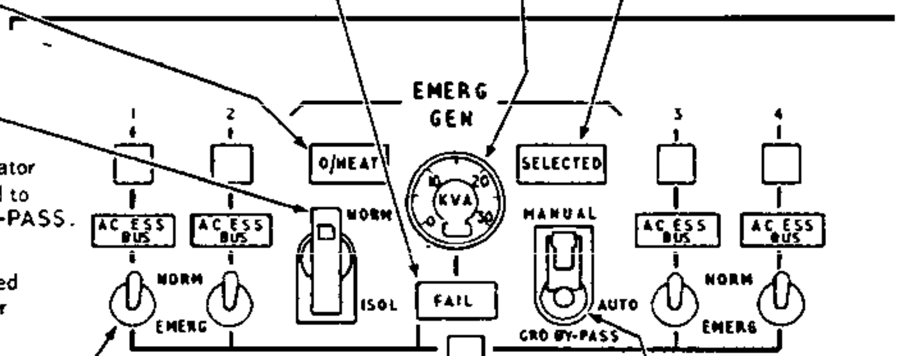
EMERGENCY GENERATOR LOAD INDICATOR
Displays output of the emergency generator.

EMERGENCY GENERATOR FAIL CAPTION (Yellow)
ILLUMINATED - indicates generator output is outside prescribed limits. Operable only when unit is selected. Incorporates press-to-reset contacts to reset generator following trip-out.

EMERGENCY GENERATOR SELECTED CAPTION (Blue)
ILLUMINATED - indicates emergency generator select but not necessarily supplyi load.

EMERGENCY GENERATOR OVERHEAT CAPTION (Red)
ILLUMINATED - indicates generator overheat.

EMERGENCY GENERATOR ISOLATE SWITCH
NORM - permits run-up of generator when MODE switch is selected to AUTO, MANUAL, or GRD BY-PASS.
ISOL - prevents operation of the emergency generator. Also used to shut down the generator after use in flight or after return of generator control switch to AUTO from GRD BY-PASS.



CMB 71 00 00 0 ECMB

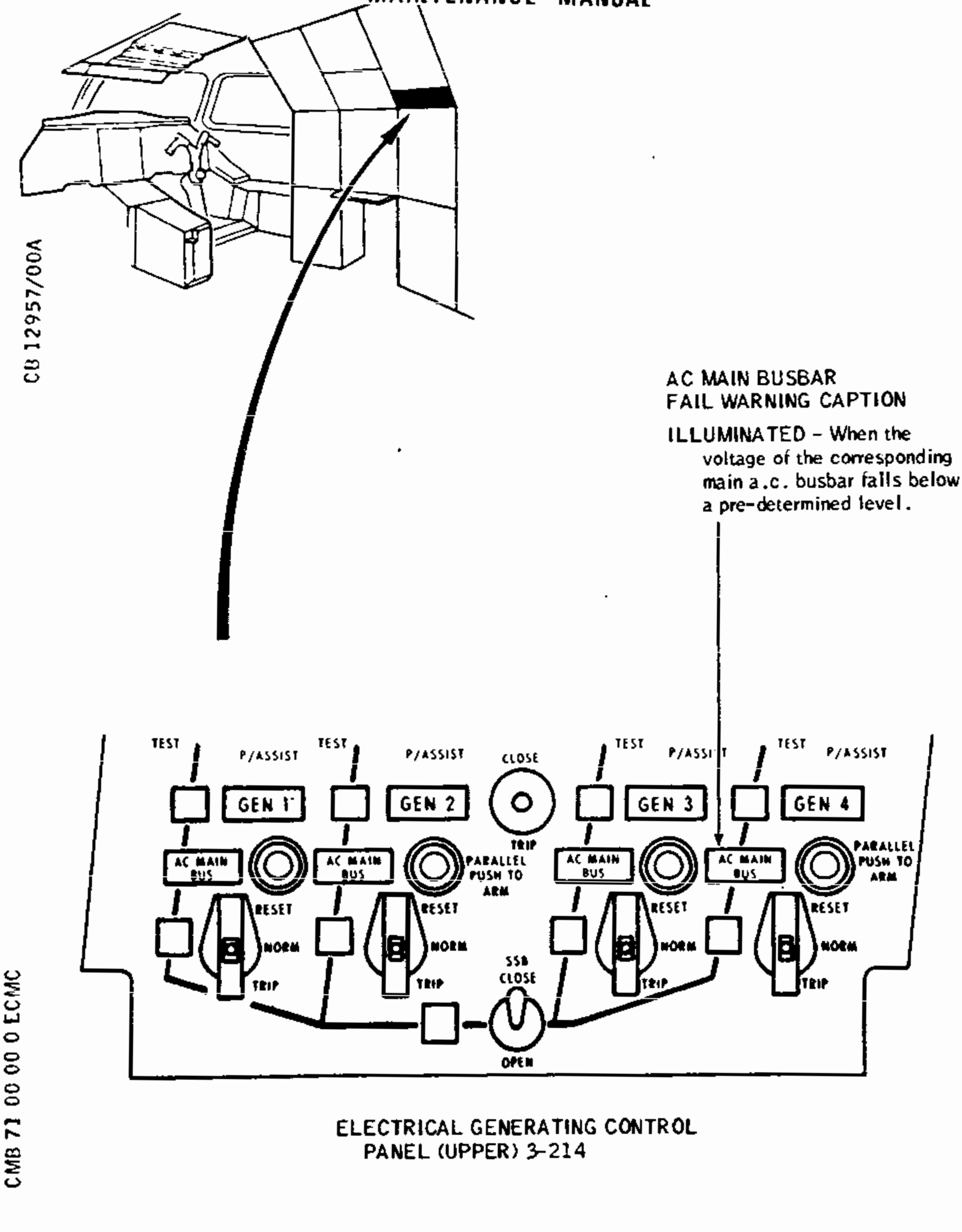
NORMAL/EMERGENCY CONTROL SWITCH
NORM - essential a.c. busbar supplied from correspondingly-numbered main a.c. busbar.
EMERG - initiates run-up of emergency generator and change-over of the essential a.c. busbar to the associated 'A' or 'B' emergency a.c. busbar and hence to the output of the emergency generator.

NOTE: Run-up of the emergency generator by operation of a NORM - EMERG switch to EMERG is normally inhibited while the aircraft is on the ground unless the emergency a.c. generation system is set for 'ground by-pass' operation and the green hydraulic system is pressurized.

AUTO-SHED BREAKER M.I.
IN-LINE - ASB closed; all essential a.c. busbars can be supplied from emergency generator.
CROSS-LINE - ASB open, 'B' emergency busbar isolated. Emergency generator supply limited to 'A' sub-system (Nos.1 and 2) essential a.c. busbars only. ASB will open when both No.1 and No.2 engine speeds fall below 58 per cent N2.

EMERGENCY GENERATOR MODE SELECTOR SWITCH
AUTO - permits automatic run-up of the generator in the event of loss of any main a.c. busbar or loss of both 1 and 2 engines. Inoperative on the ground.
GRD BY-PASS - permits operation of the automatic circuits for test purposes on ground.
MANUAL - permits run up of generator independently from and overriding the automatic circuits. Used for pre-flight checks and in air as an emergency override only.
NOTE: This switch is guarded

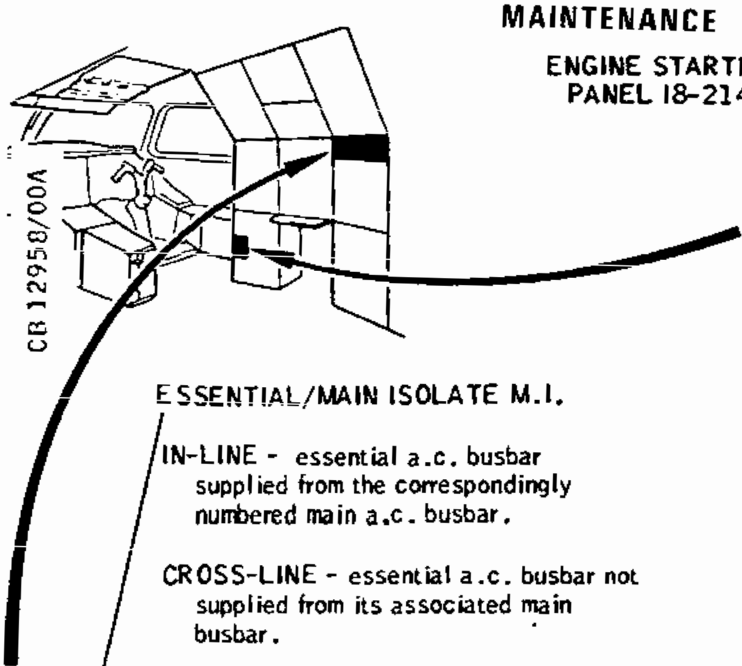
Systems Management - Electrical Sheet 2 of 4
R Figure 007



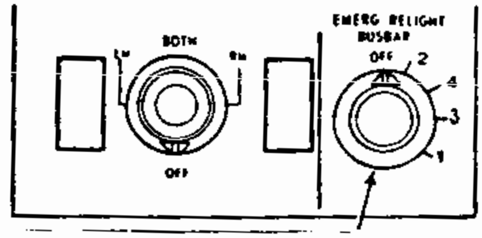
R

Systems Management - Electrical Sheet 3 of 4
Figure 007

Printed in England



ENGINE STARTING PANEL 18-214



RELIGHT BUSBAR SELECTOR SWITCH

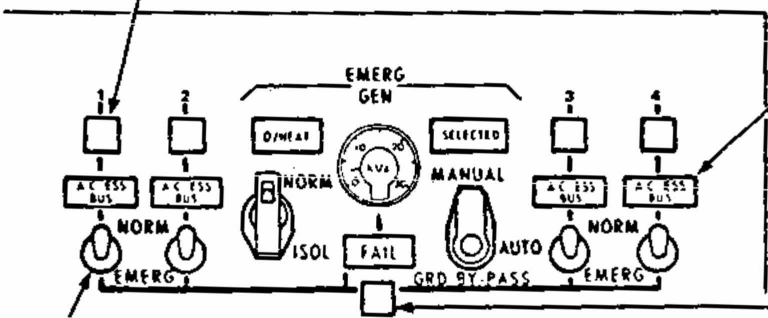
OFF - each relight busbar connected to the correspondingly numbered main a.c. busbar.

2, 4, 3, 1 - at each position, the selected engine relight busbar is connected to the 'A' emergency busbar.

ESSENTIAL/MAIN ISOLATE M.I.

IN-LINE - essential a.c. busbar supplied from the correspondingly numbered main a.c. busbar.

CROSS-LINE - essential a.c. busbar not supplied from its associated main busbar.



AC ESSENTIAL BUSBAR FAIL WARNING CAPTION

ILLUMINATED - when the voltage of the corresponding essential busbar falls below a predetermined level.

AUTO-SHED BREAKER M.I.

IN-LINE - ASB closed; all essential a.c. busbars can be supplied from emergency generator.

CROSS-LINE - ASB open 'B' emergency busbar isolated. Emergency generator supply limited to 'A' sub-system (Nos.1 and 2) essential a.c. busbars only. ASB will normally remain open until both Nos.1 and 2 engines have been run up to 62% N_2.

ELECTRICAL GENERATING CONTROL PANEL (LOWER) 6-214

NORMAL/EMERGENCY CONTROL SWITCH

NORM - essential a.c. busbar supplied from correspondingly-numbered main a.c. busbar.

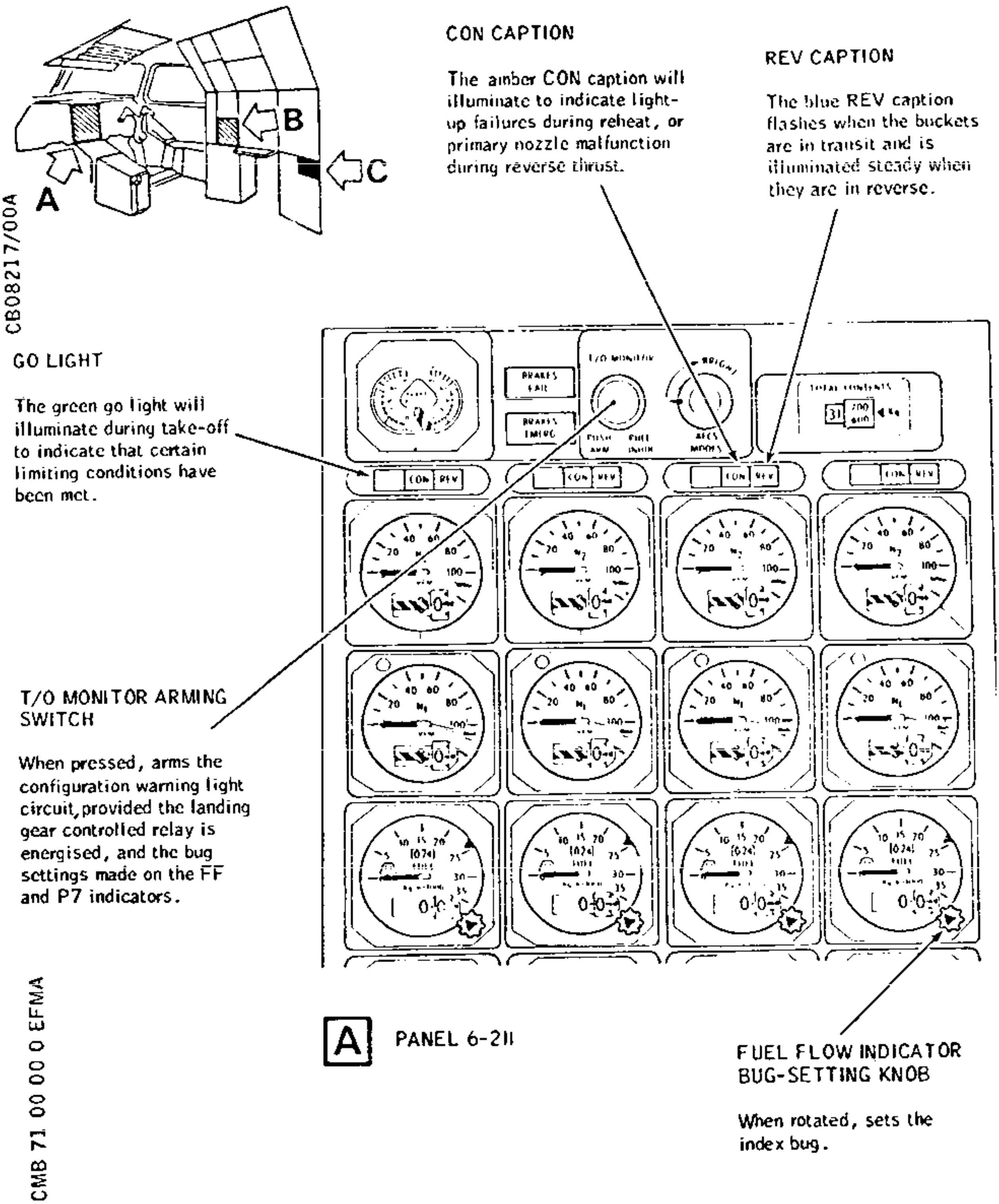
EMERG - set to initiate run-up of emergency generator and change over the essential a.c. busbar to the associated 'A' or 'B' emergency a.c. busbar and hence to the output of the emergency generator.

NOTE: Run-up of the emergency generator by operation of a NORMAL/EMERGENCY switch to EMERG is normally inhibited while the aircraft is on the ground unless the emergency a.c. generation system is set for 'ground by-pass' operation and the green hydraulic system is pressurized (Ref. 24-22-00).

CMB 71 00 00 0 ECMD

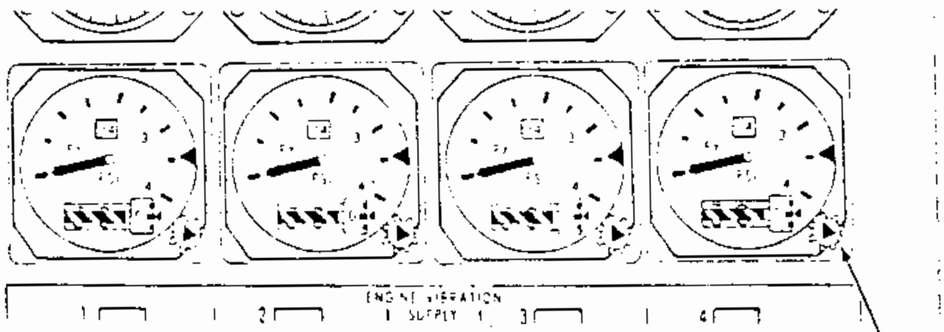
R

Systems Management - Electrical Sheet 4 of 4
Figure 007



Systems Management - Configuration Lights
Sheet 1 of 2
Figure 008

CB 08222/00C



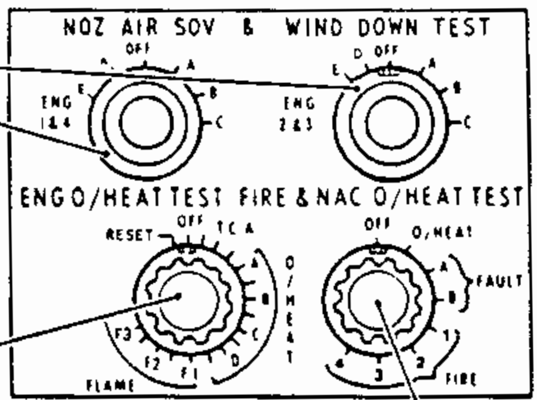
B PANEL 4-214

P7 INDICATOR BUG SETTING KNOB

When rotated, sets the index bug

NOZ AIR SOV AND WIND DOWN TEST SWITCHES

When rotated to position A or B provides a test facility for the Nos. 1 and 4, or 2 and 3 engines CON caption in the reverse thrust mode.



ENG O/H TEST

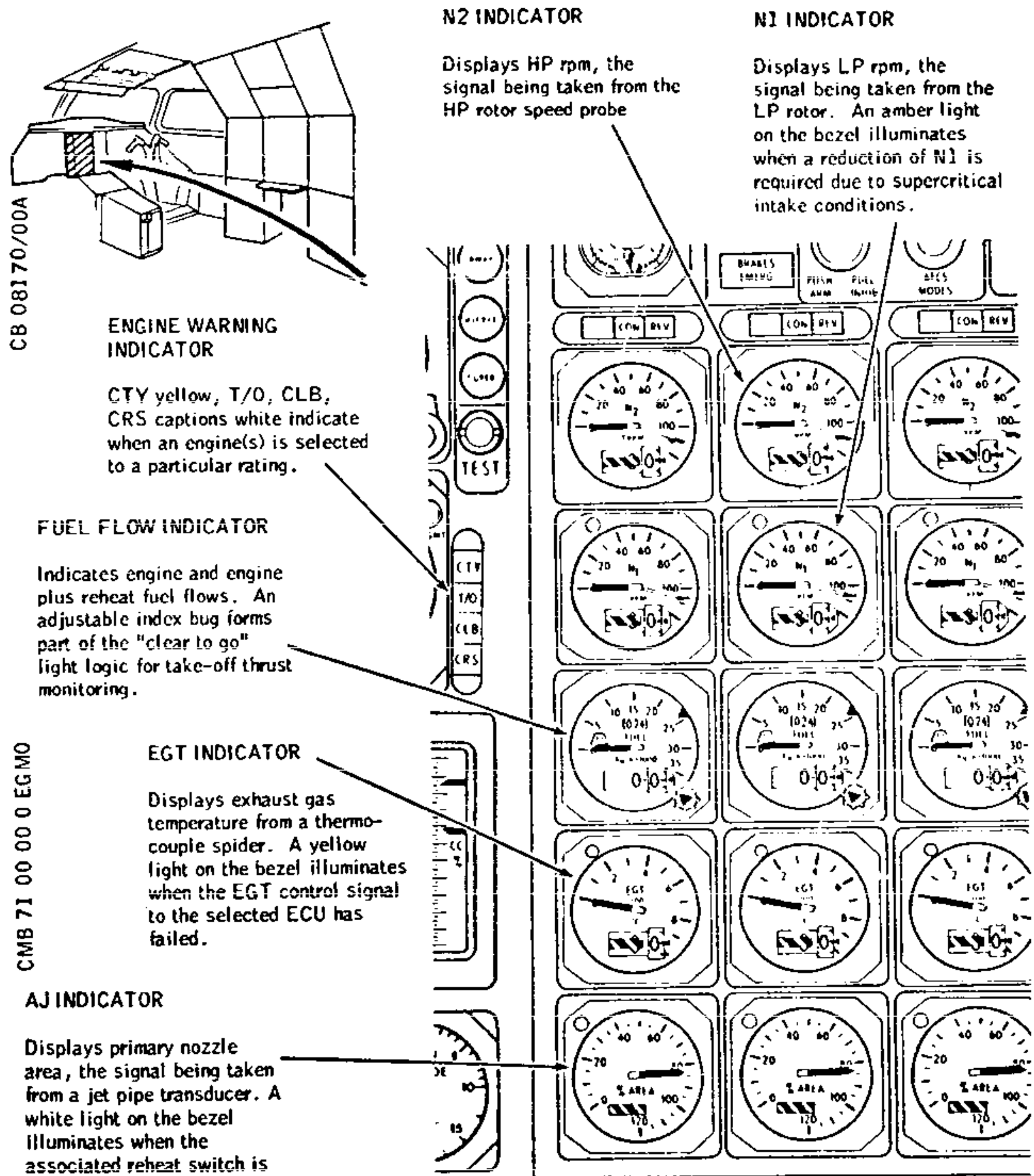
Used for testing the inputs to warning lights

C PANEL 27-214

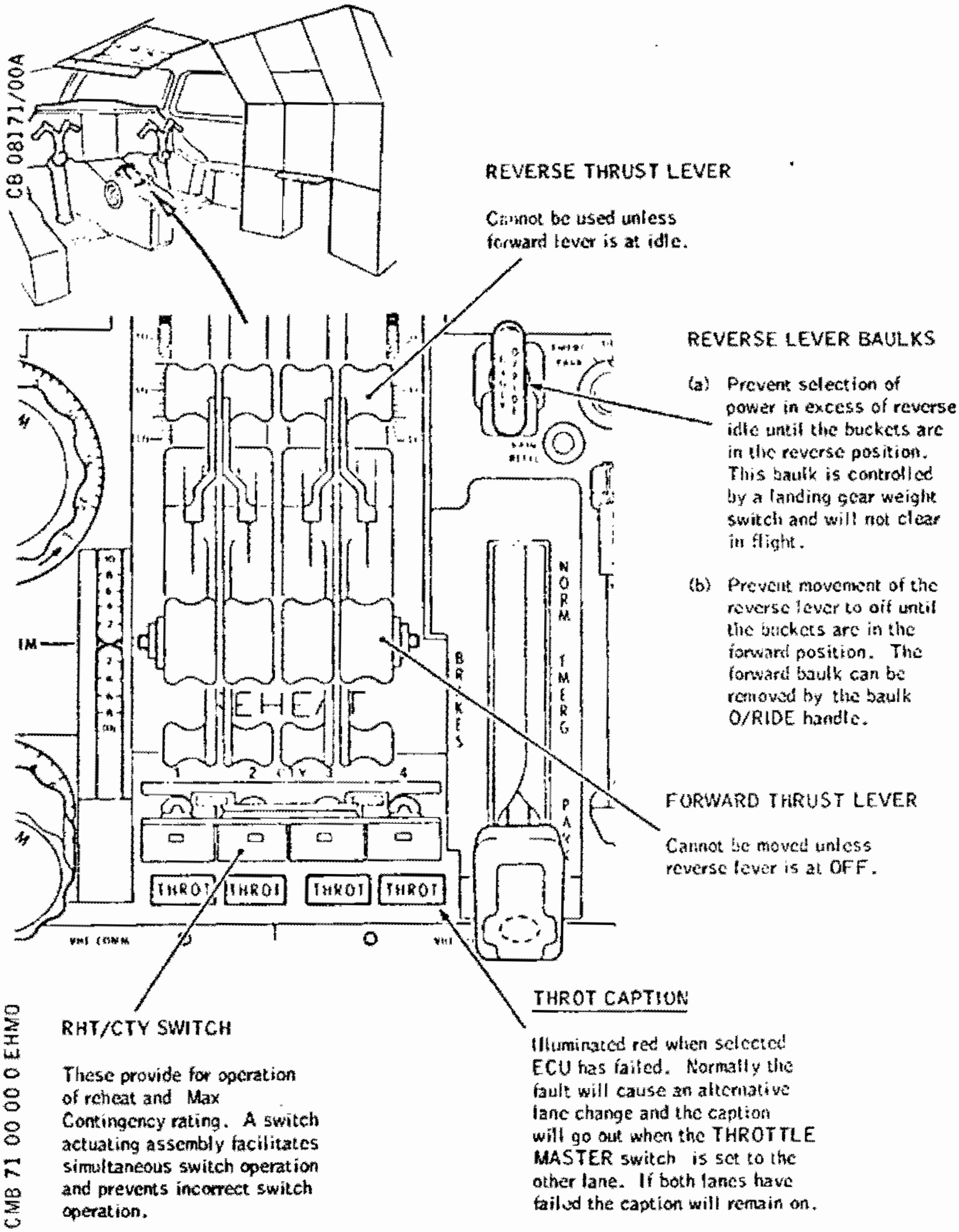
FIRE & NAC O/HEAT TEST

CMB 71 00 00 0 EF MB

Systems Management - Configuration Lights
R Sheet 2 of 2
Figure 008

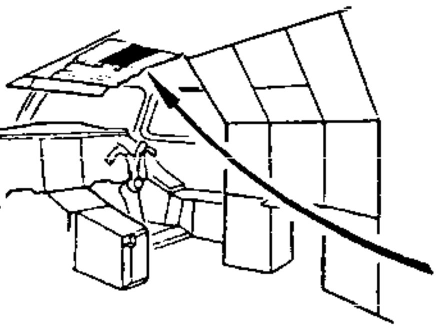


Systems Management - Engine Main Instruments
R Figure 009



R

Systems Management - Centre Console
Figure 010



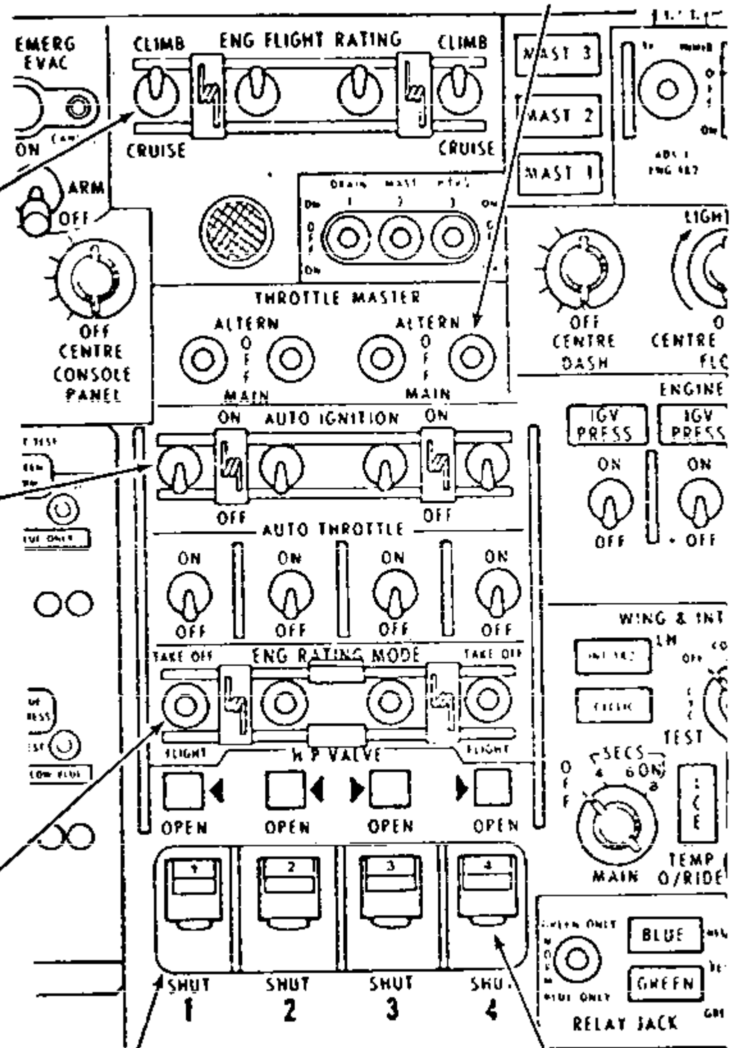
CB 08172/00A

THROTTLE MASTER SWITCH

This is a locked toggle switch. The switch toggle illuminates simultaneously with the THROT caption.

ENG FLIGHT RATING SWITCH

Enables CLIMB or CRUISE rating to be set when ENGINE RATING MODE switch switch is at FLIGHT. An actuating assembly facilitates simultaneous switch operation.



AUTO IGNITION SWITCH

This has a switch actuating assembly to give auto-ignition on all engines. On receipt of an engine flame-out signal (with auto ignition ON), The ECU causes the throttle valve to close rapidly and energizes the igniters and start pump. Following relight the throttle valve reopens automatically.

ENGINE RATING MODE SWITCH

This switch is held magnetically at FLIGHT when the landing gear is retracted. With the gear down the switch will spring return to TAKE-OFF. An actuating assembly facilitates simultaneous switch operation.

CMB 71 00 00 0 EJMO

HP VALVE MI

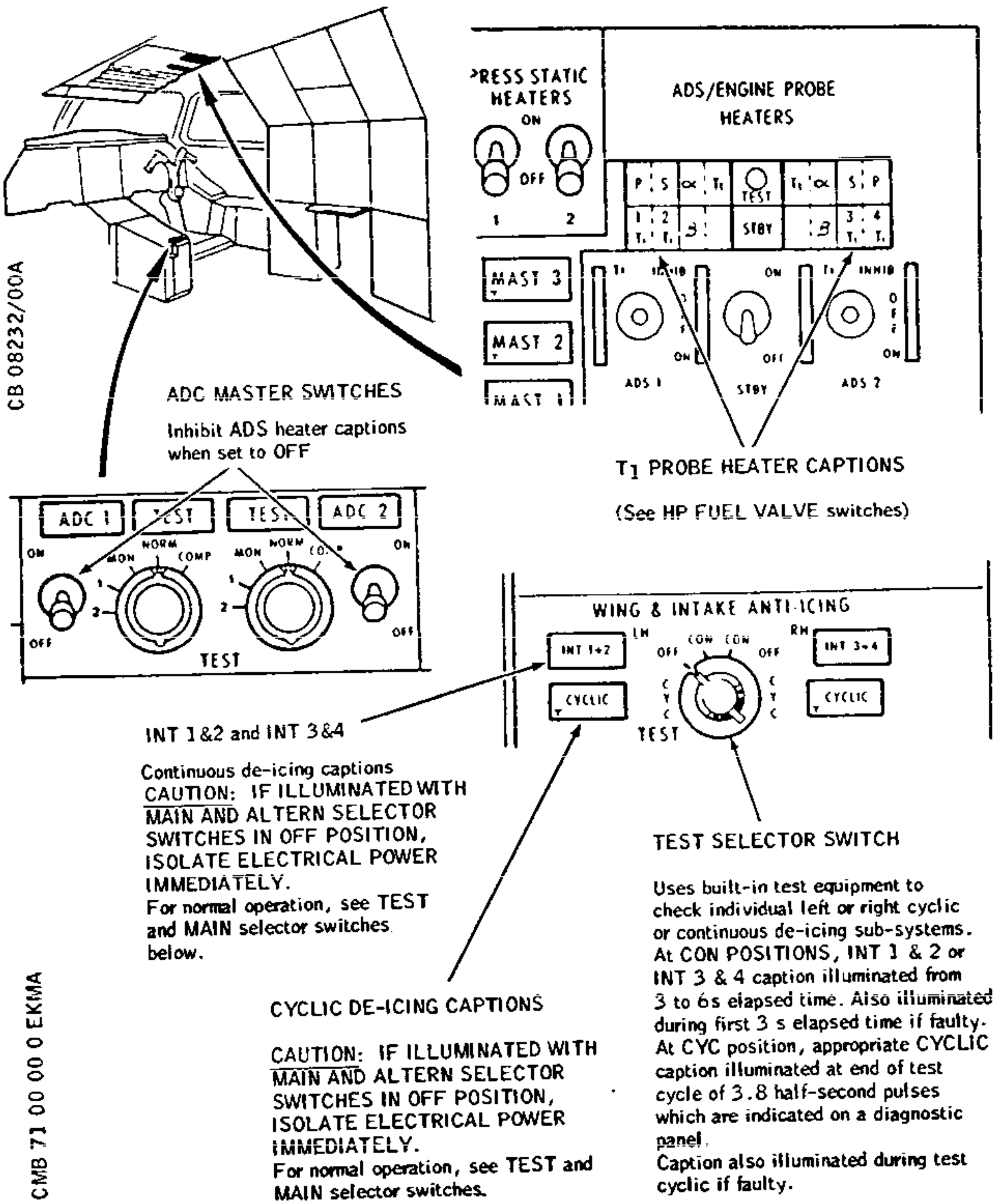
Shows SHUT or OPEN

HP VALVE SWITCH

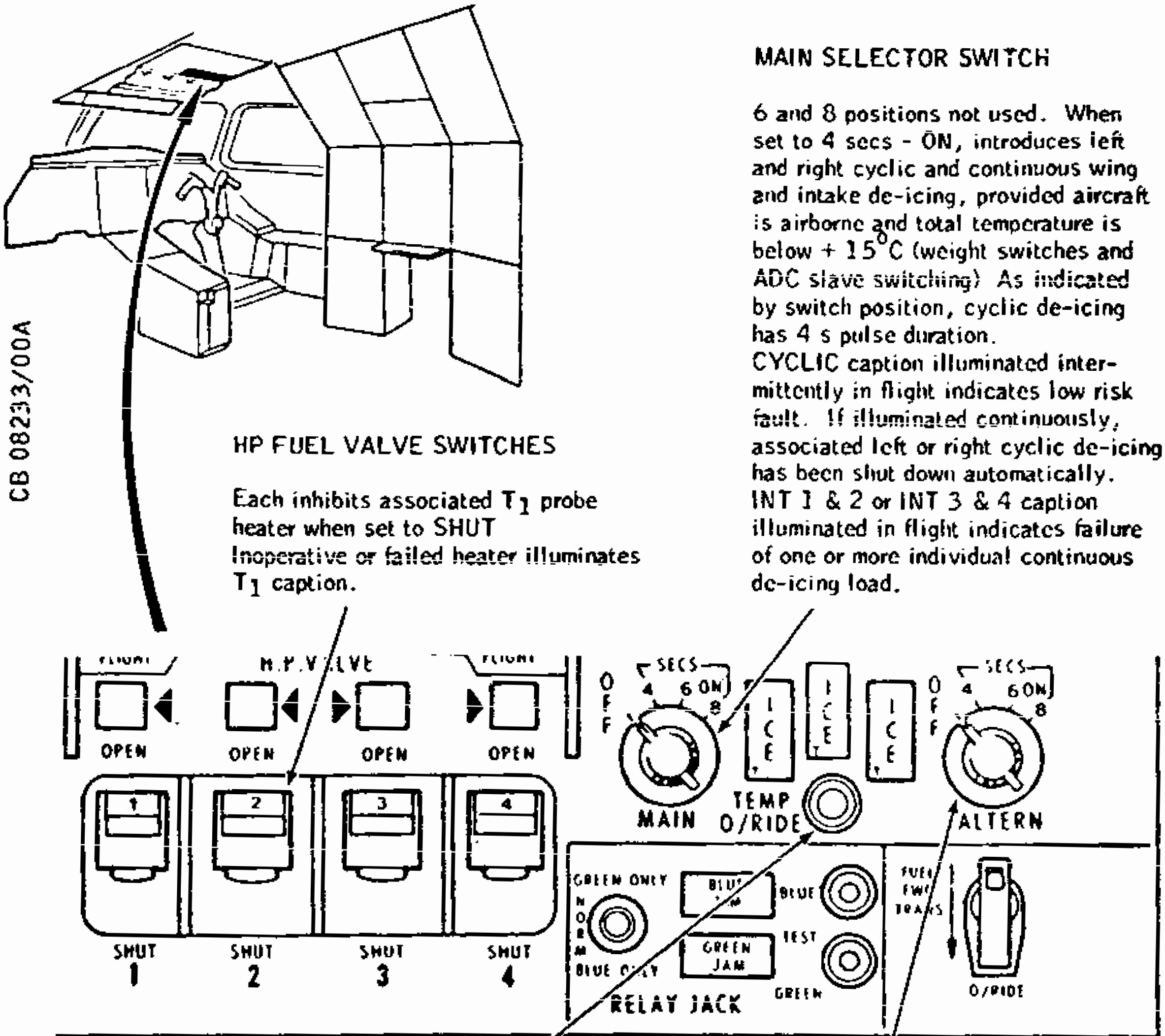
This is a locked toggle switch. The switch toggle illuminates if the HP valve is OPEN with the engine shut-down handle pulled.

Systems Management - Pilots Roof Panel
Figure 011

R



Systems Management - Engine Anti-Icing
Sheet 1 of 2
Figure 012



MAIN SELECTOR SWITCH

6 and 8 positions not used. When set to 4 secs - ON, introduces left and right cyclic and continuous wing and intake de-icing, provided aircraft is airborne and total temperature is below + 15°C (weight switches and ADC slave switching) As indicated by switch position, cyclic de-icing has 4 s pulse duration.
CYCLIC caption illuminated intermittently in flight indicates low risk fault. If illuminated continuously, associated left or right cyclic de-icing has been shut down automatically.
INT 1 & 2 or INT 3 & 4 caption illuminated in flight indicates failure of one or more individual continuous de-icing load.

HP FUEL VALVE SWITCHES

Each inhibits associated T_1 probe heater when set to SHUT
Inoperative or failed heater illuminates T_1 caption.

TEMP O/RIDE SWITCH

If fault occurs in total temperature switching associated with ALTERN selector switch, causing loss of the de-icing, pressing and releasing this switch will re-instate the de-icing.
Self-latching circuit means that fault remains by-passed until ALTERN selector switch returned to OFF position.

ALTERN SELECTOR SWITCH

This switch and MAIN selector switch used on alternate flights. Operation same as MAIN selector switch except that total temperature faults can be overcome by using TEMP O/RIDE switch.

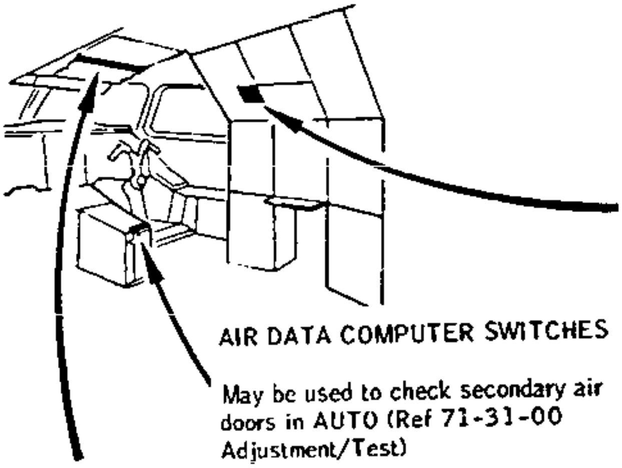
CB 08233/00A

CMB 71 00 00 0 EKMB

Systems Management - Engine Anti-Icing
Sheet 2 of 2
Figure 012

R

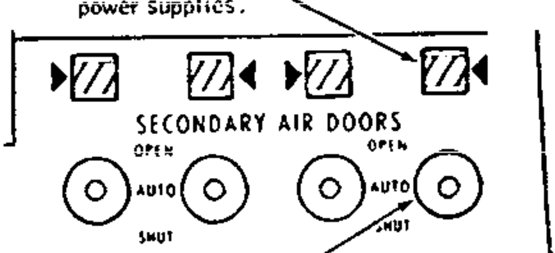
CB 08218/00A



SECONDARY AIR DOOR M.I.

SHUT / OPEN

Indicates the position of the secondary air doors. Diagonal lines indicate doors in transit or failure of electrical power supplies.



AIR DATA COMPUTER SWITCHES

May be used to check secondary air doors in AUTO (Ref 71-31-00 Adjustment/Test)

SECONDARY AIR DOOR CONTROL SWITCH

OPEN - A locked toggle switch used to open the doors on the ground.

AUTO Used for system tests only.

SHUT With power supplies connected to the aircraft the secondary air doors will close as soon as the control switch is moved from OPEN by a signal from the air data computer.

CAUTION: TO AVOID DAMAGE TO THE MOTOR, DO NOT OPERATE MORE THAN ONE CYCLE IN A PERIOD OF 2 MINUTES.

ENGINE SHUT-DOWN HANDLE
(Emergency only)

Pull handle to operate the fire flaps.

CAUTION: THE OTHER SYSTEMS OPERATED BY THE HANDLE MUST FIRST BE MADE SAFE. (Ref. 26-22-00).

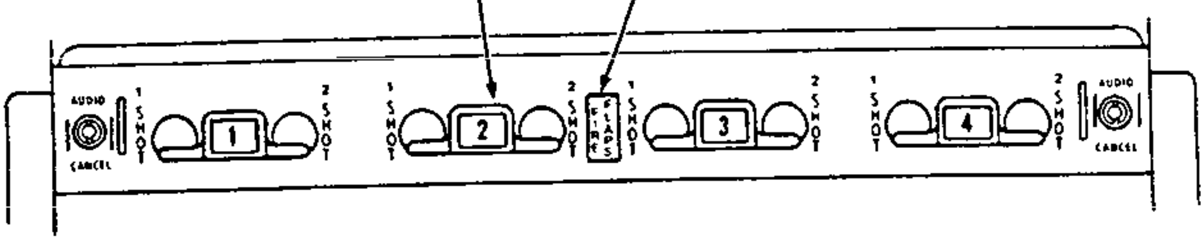
Manually reset the handle after use.

Each handle has a right light that flashes to indicate a fire together with an audible bell and MWS gong.
Steady illumination of the red light with associated gong indicates the necessity for an emergency shut-down.
When the handle is pulled the HP valve, LP valve, reheat shut-off valve, hydraulic shut-off valves, air conditioning shut-off valves (engine bleed, cross bleed and security) are closed as are the Secondary air doors and Engine Bay Ventilation flap. The last two items cause the FIRE FLAPS caption to illuminate. The HP valve switch light also illuminate.

FIRE FLAPS CAPTION (Green)

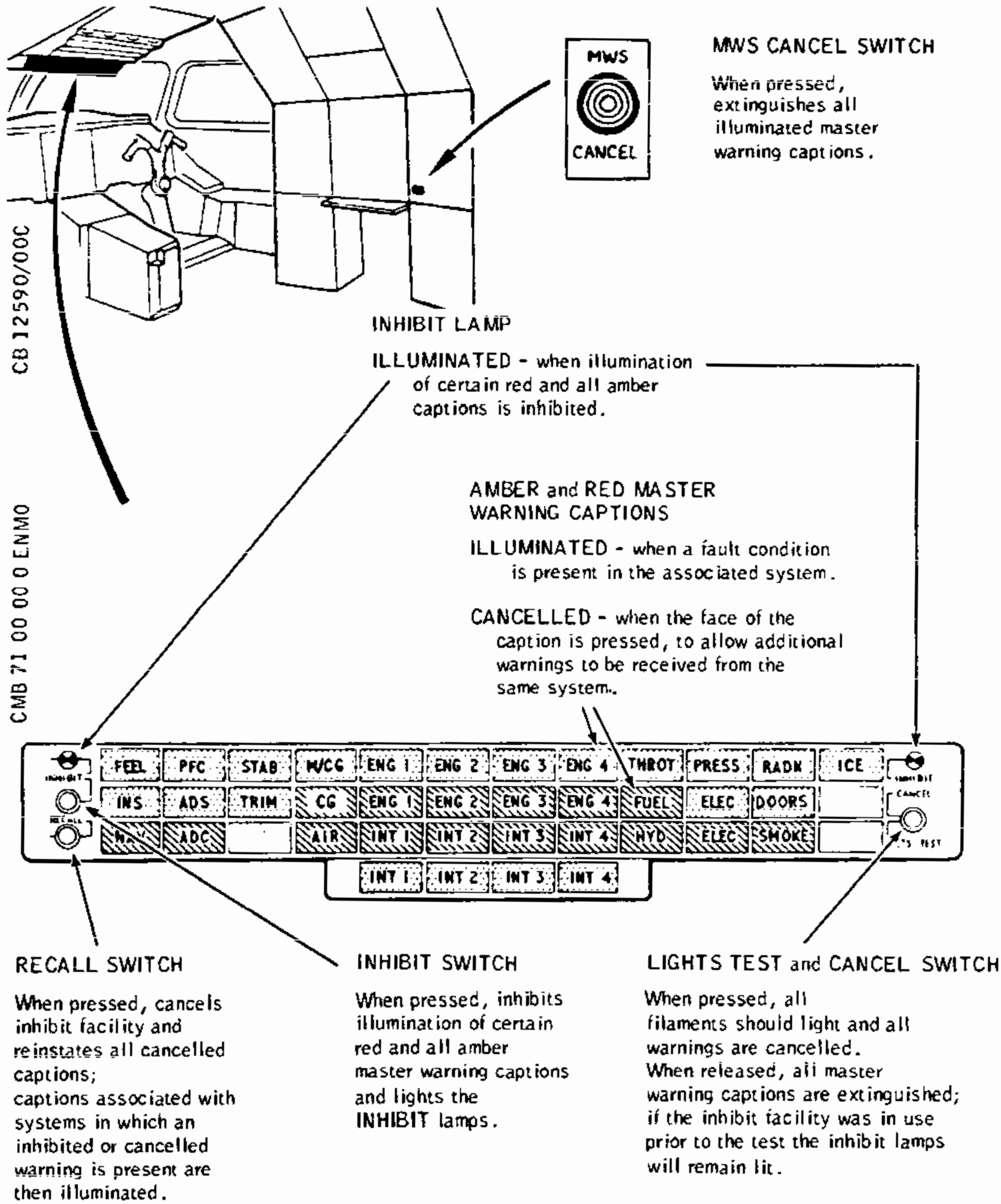
ILLUMINATED - Indicates that the secondary air doors and engine bay vent flap are closed. Press to cancel caption light.

CMB 71 00 00 0 EMMO



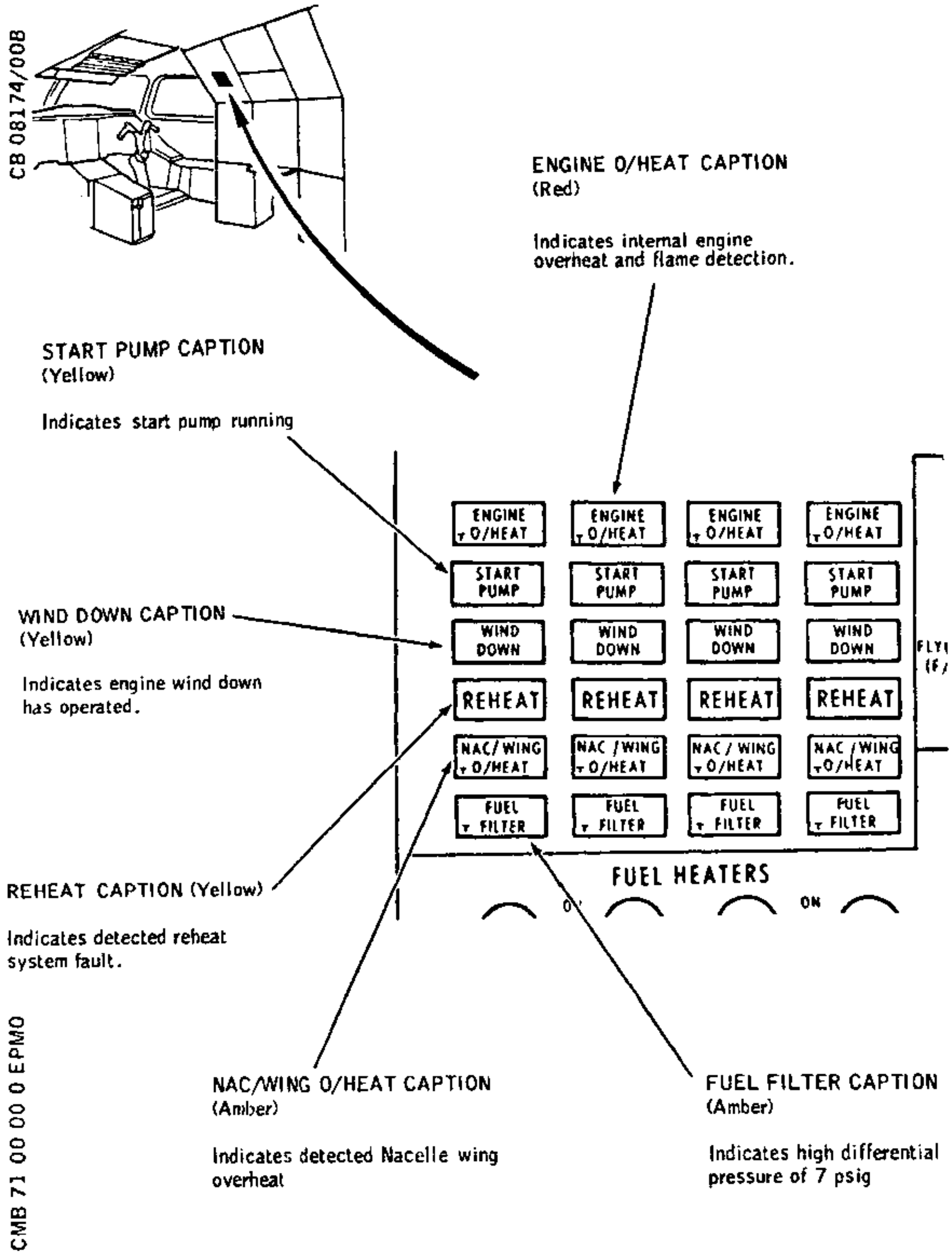
Systems Management - Fireflaps and Secondary Air Doors
Figure 013

R

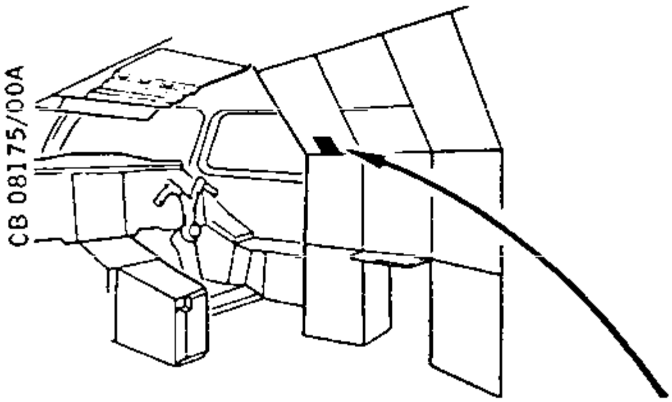


R

Systems Management - Master Warning System
Figure 014

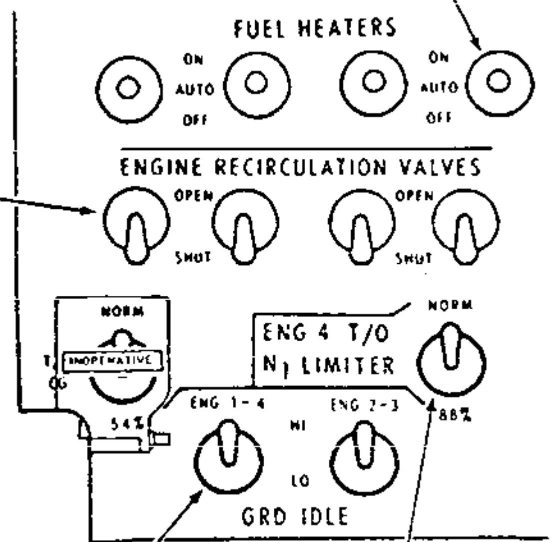


R Systems Management - Engine Warning Captions
Figure 015



FUEL HEATER SWITCH

These switches permit AUTO control of the fuel heater and override facilities to ON and OFF.



ENGINE RECIRCULATION VALVE SWITCH

These switches operate engine recirculation valves (not the fuel system recirculation valves, which are automatically controlled by fuel pressure).
The valve allows engine first stage fuel pump delivery pressure to augment the flow through the IDG and engine oil cooler at low fuel flow conditions. When the HP valve is set OFF the re-circulation valve is automatically opened to avoid overheating the 1st stage centrifugal pump.

ENG 4 T/O N_1, LIMITER SWITCH

Used to control the N_1 of engine No.4 during take-off. The 88% setting is magnetically held at speeds below 60 knots and there is a spring return to NORM. When the switch is set to 88% the N_1 of engine No.4 is limited to a maximum of 88% and the "clear to go" light is inhibited

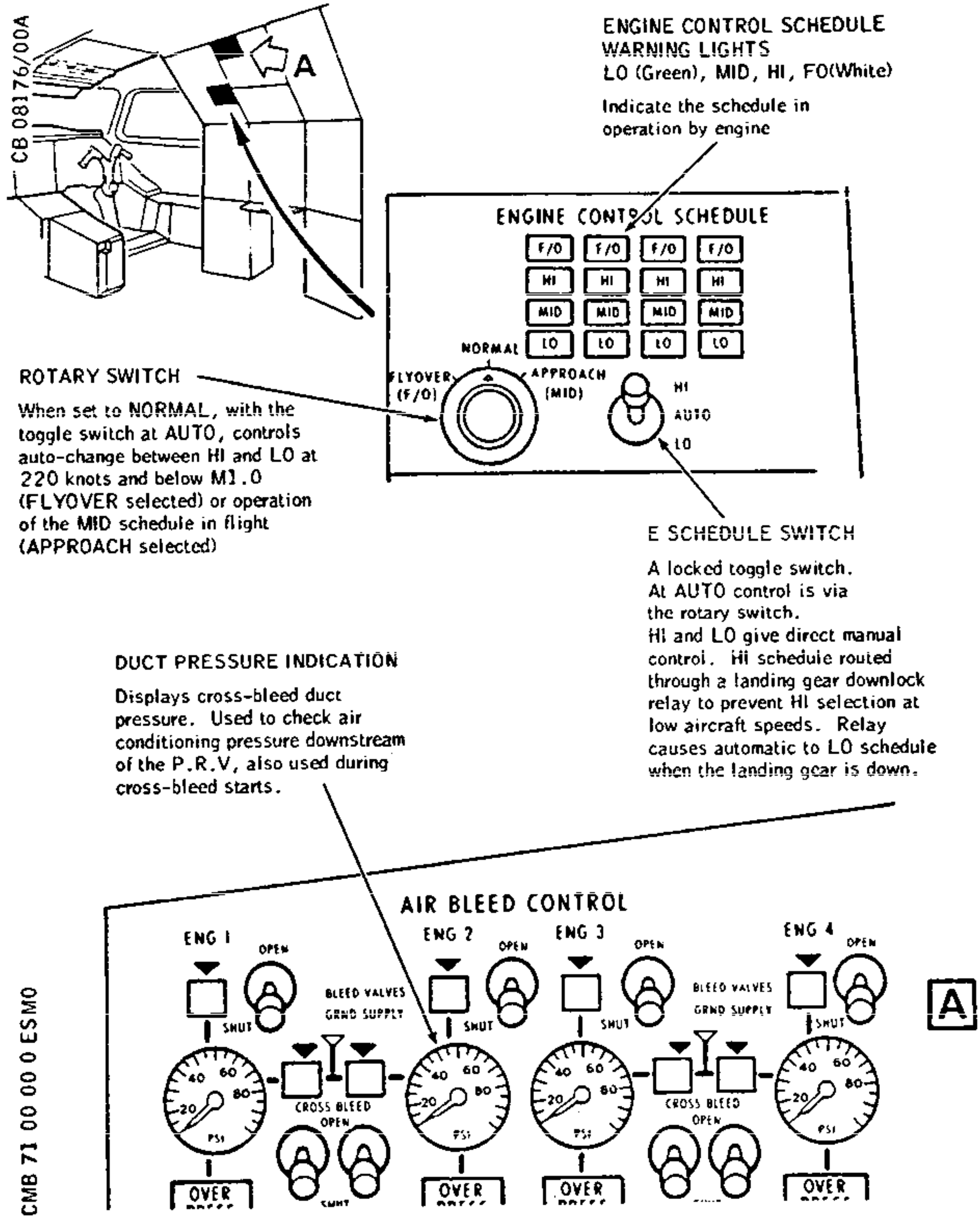
GRD IDLE SWITCH

Used for reducing idle thrust on the ground. Each switch controls a symmetrical pair of engines. The LO position is magnetically held below 60 knots and spring return to HI.

CMB 71 00 00 0 ERMO

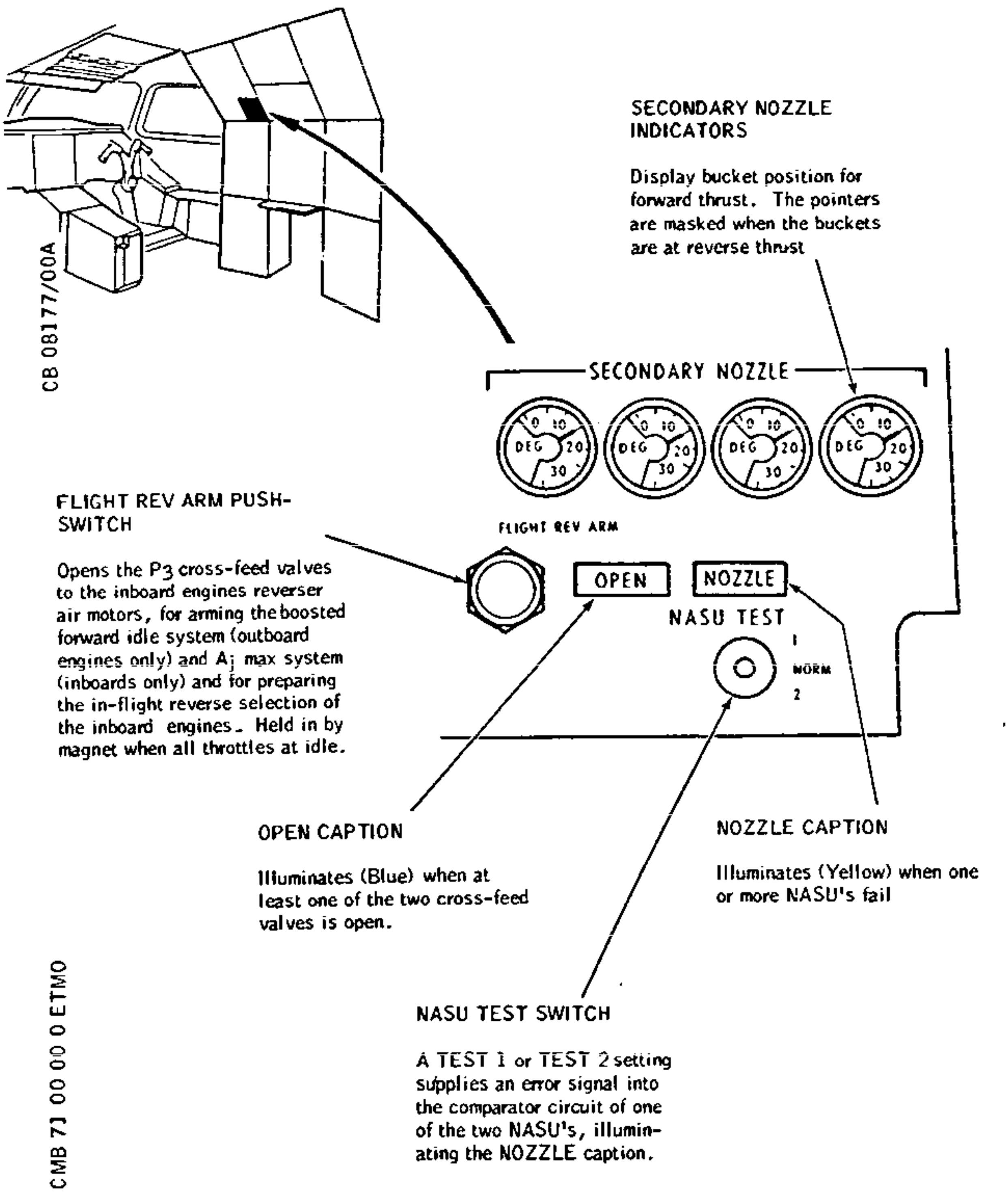
Systems Management - Power Panel
Figure 016

R

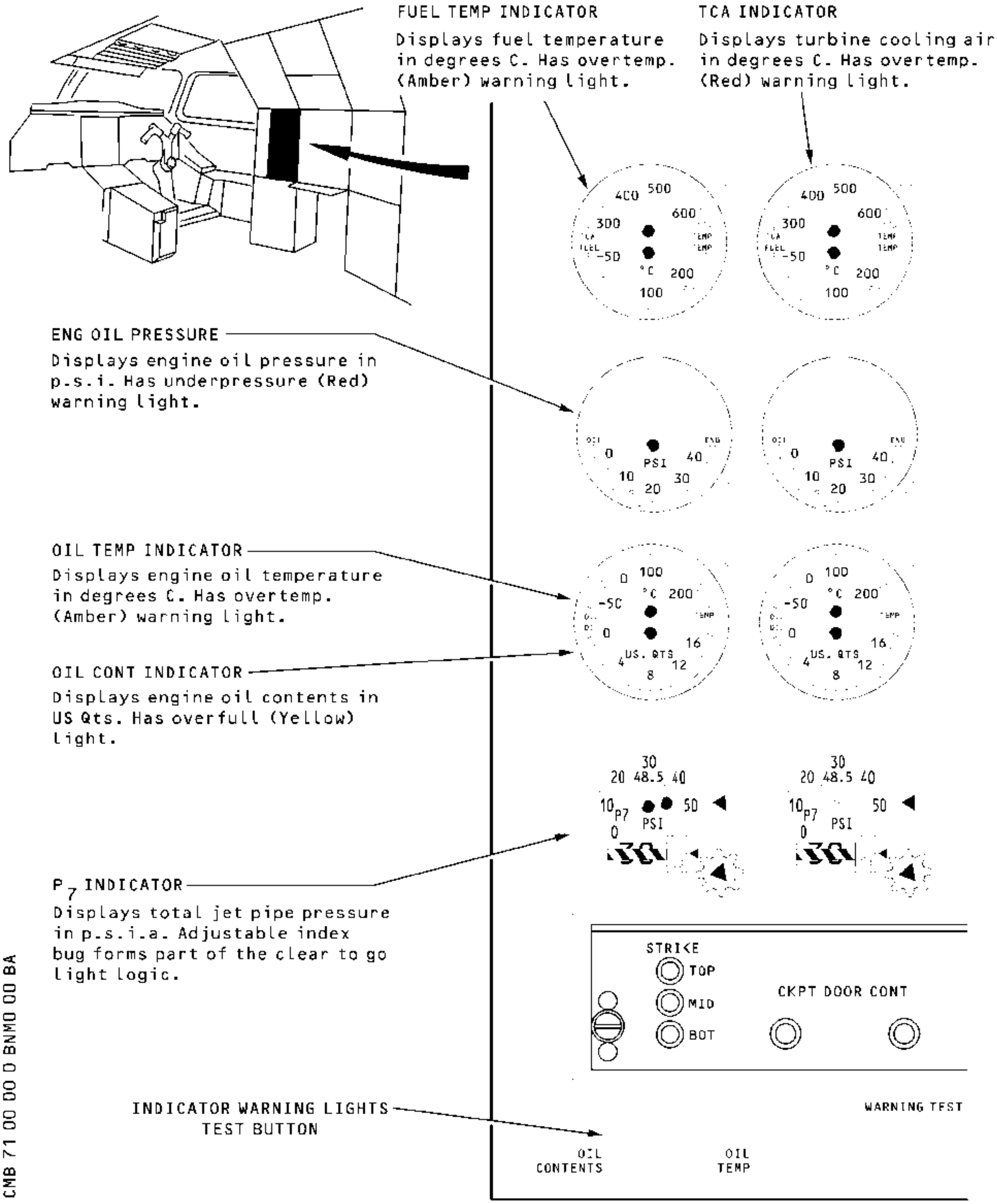


Systems Management - E Schedule
Figure 017

R



Systems Management - Secondary Nozzle
R
Figure 018



CMB 71 00 00 0 BNM0 00 BA

System Management - Power Plant
Secondary Instruments
Figure 019

R

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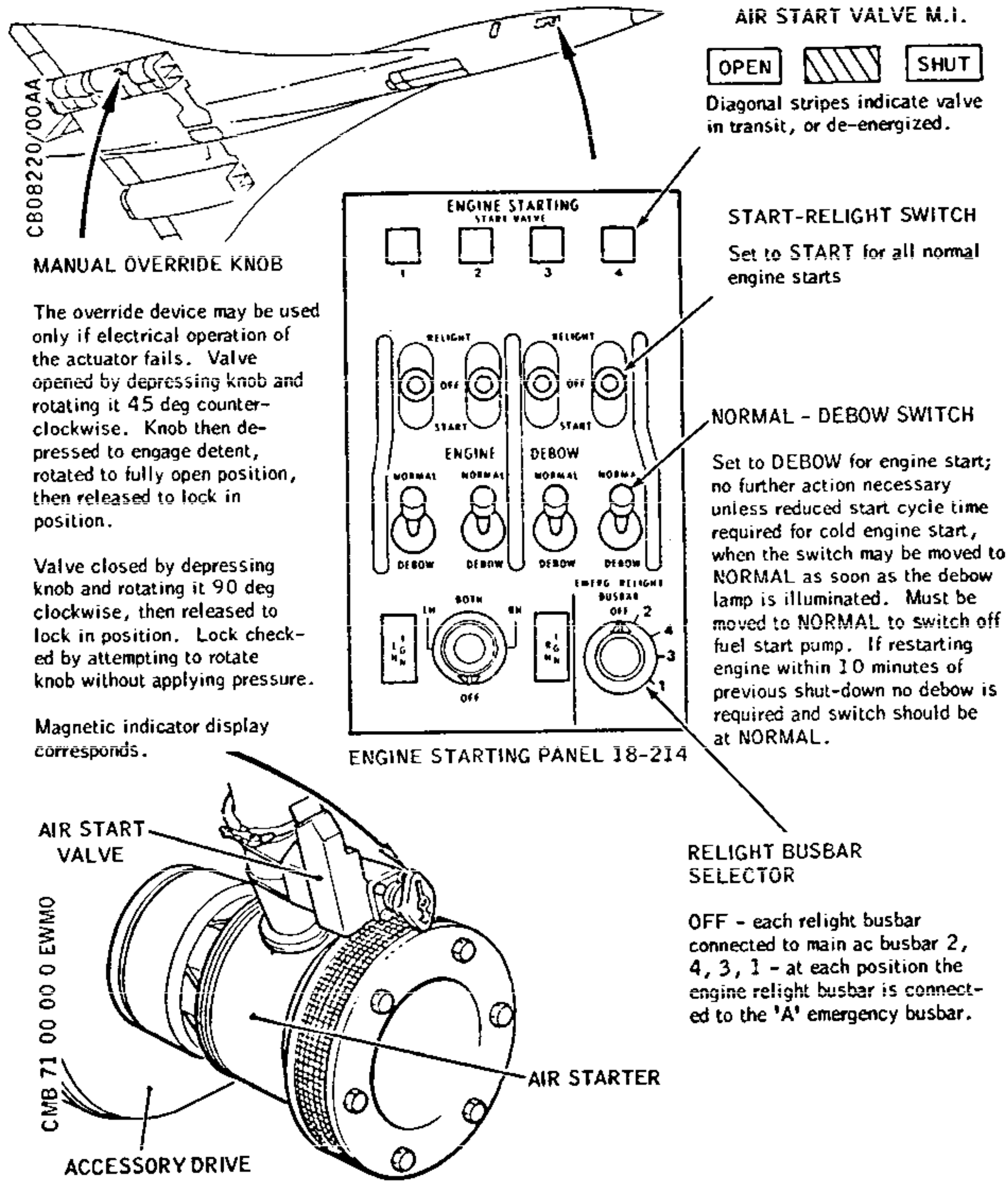
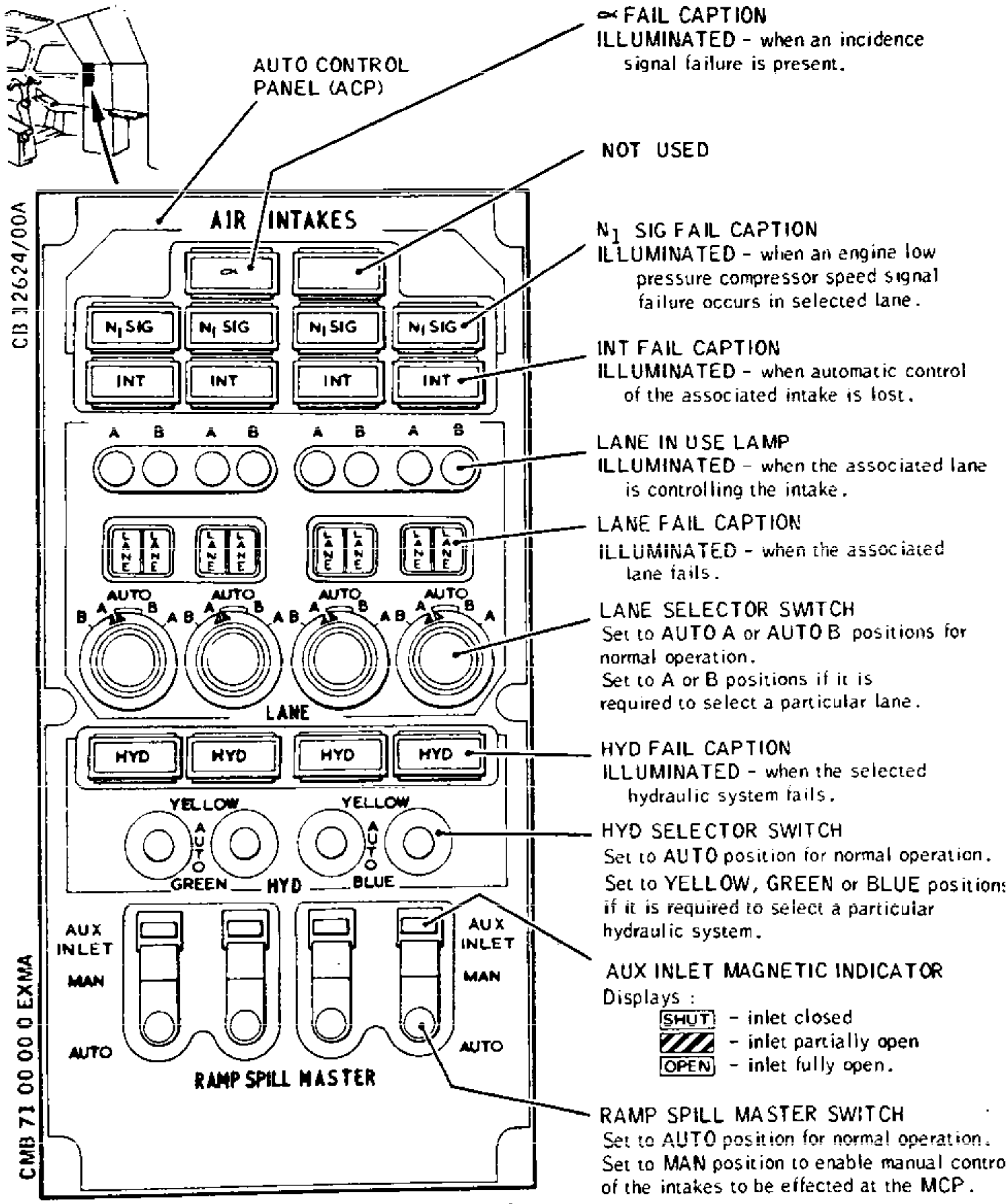


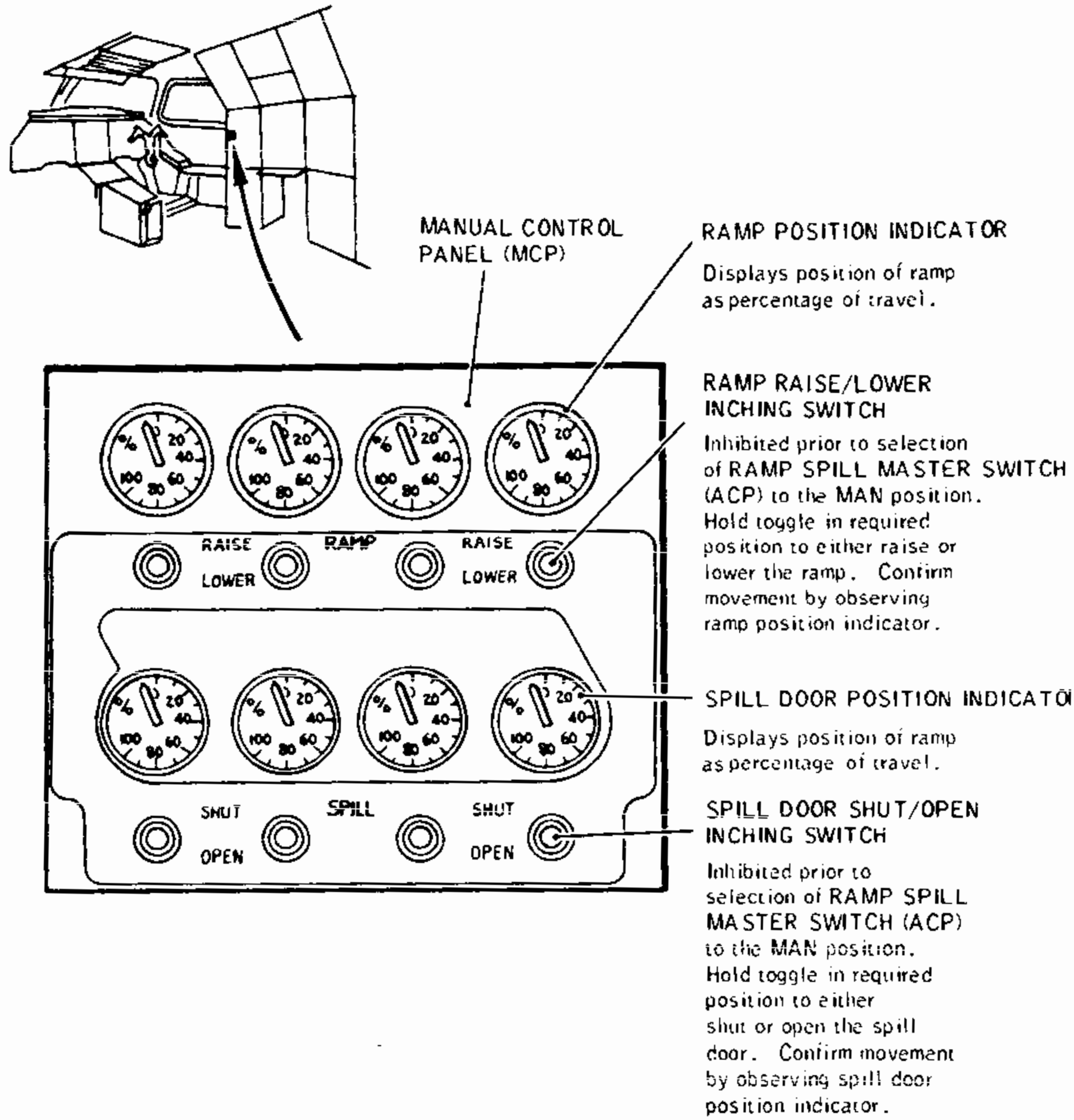
Systems Management - Starting
Figure 021

R



Systems Management - Intake Sheet 1 of 3
Figure 022

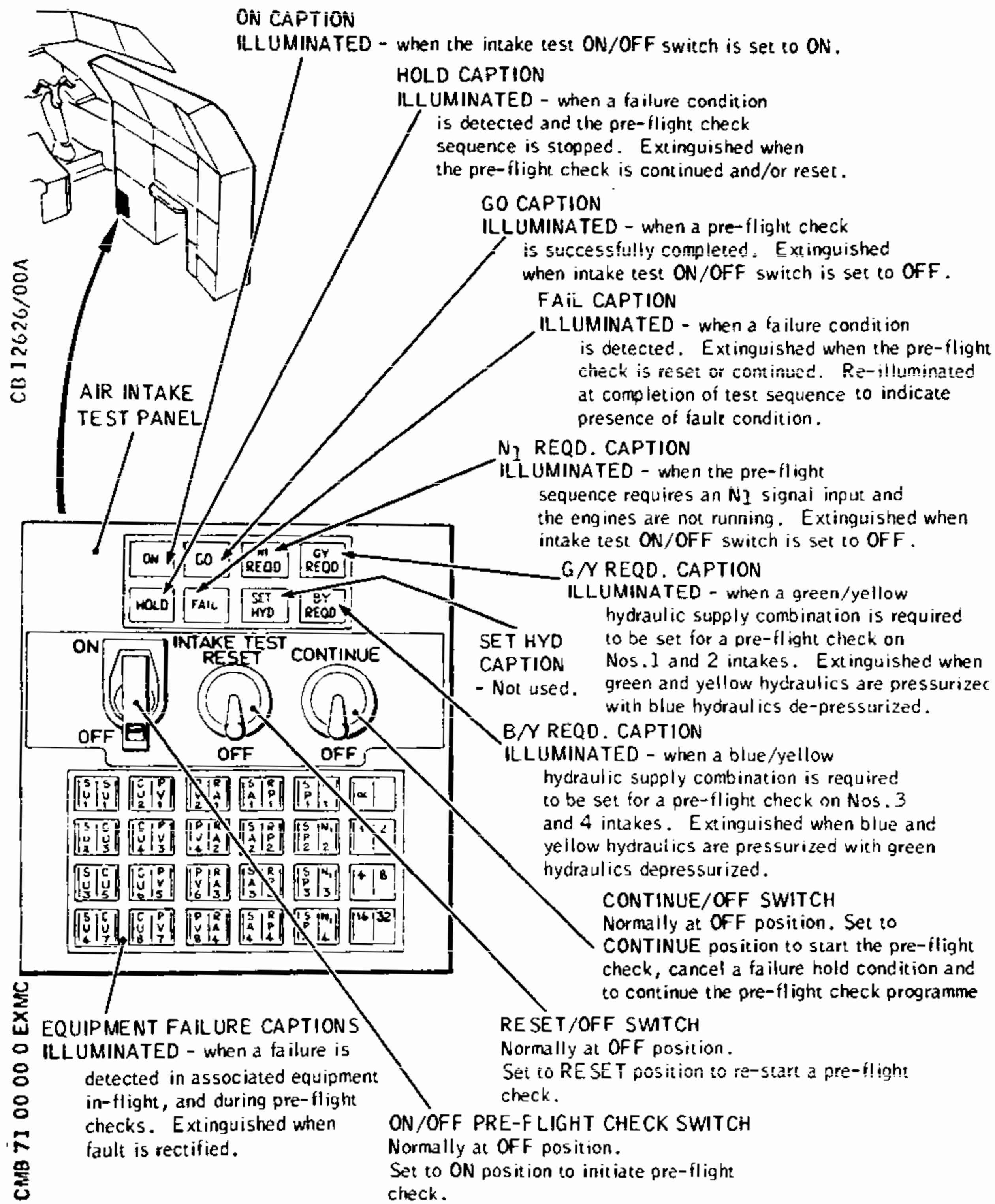
CB 12625/00A



CMB 71 00 00 0 EXMB

R

Systems Management - Intake Sheet 2 of 3
Figure 022



R

Systems Management - Intake Sheet 3 of 3
Figure 022

7. Flight Compartment Procedures

A. General

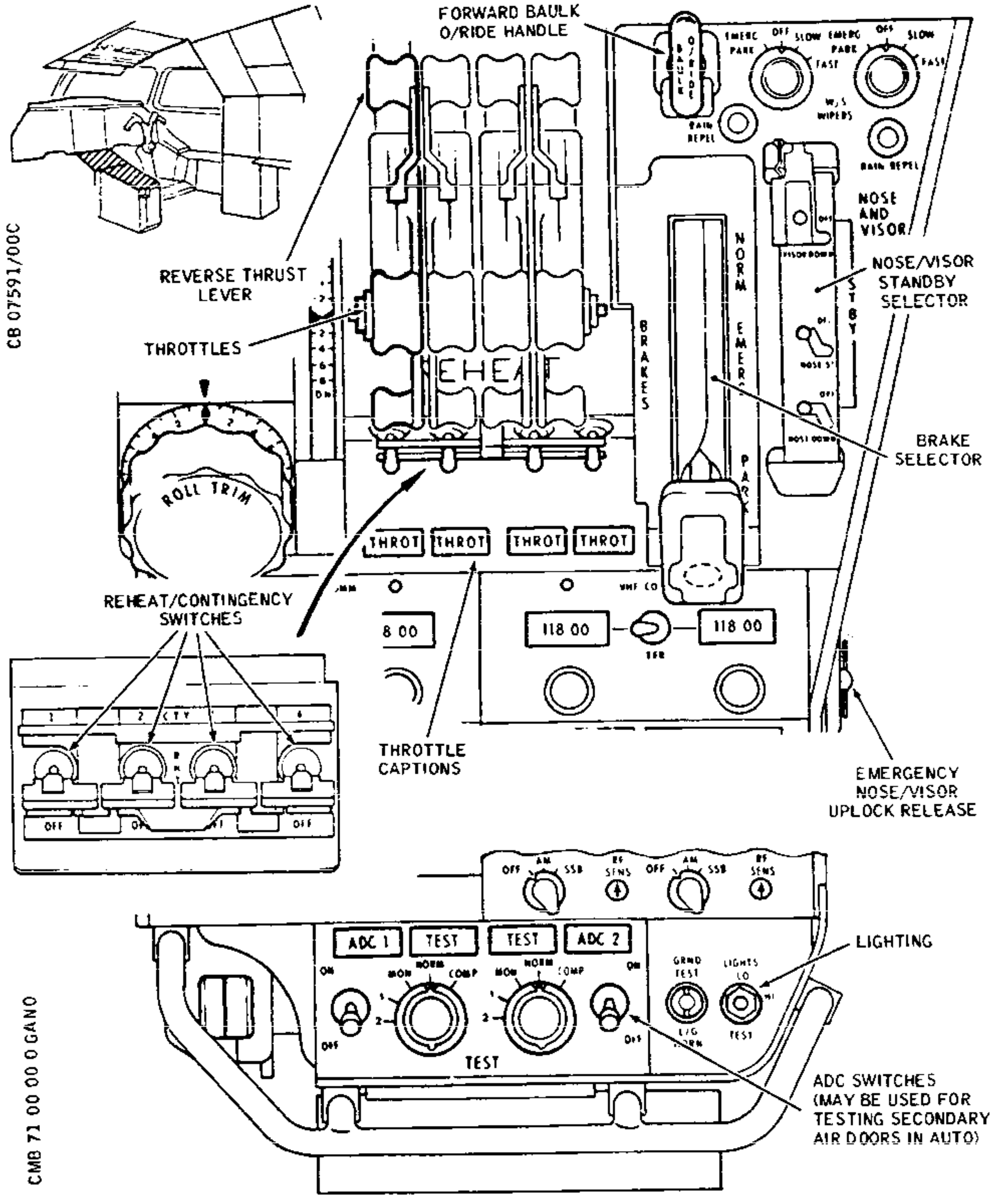
Flight compartment procedures for the power plant and its associated systems which enable these systems to be operated safely and monitored either to prove the power plant and its components or for servicing purposes, are sequenced using the controls and indicators on the following panels.

Appended in sequence are a number of selectors, switches and controls which are set or checked before starting an engine(s). The check commences from the moment the aircraft is entered and continues to a point where the actual engine start may begin. For full details of engine ground running (Ref. 71-00-00, Adjustment/Test).

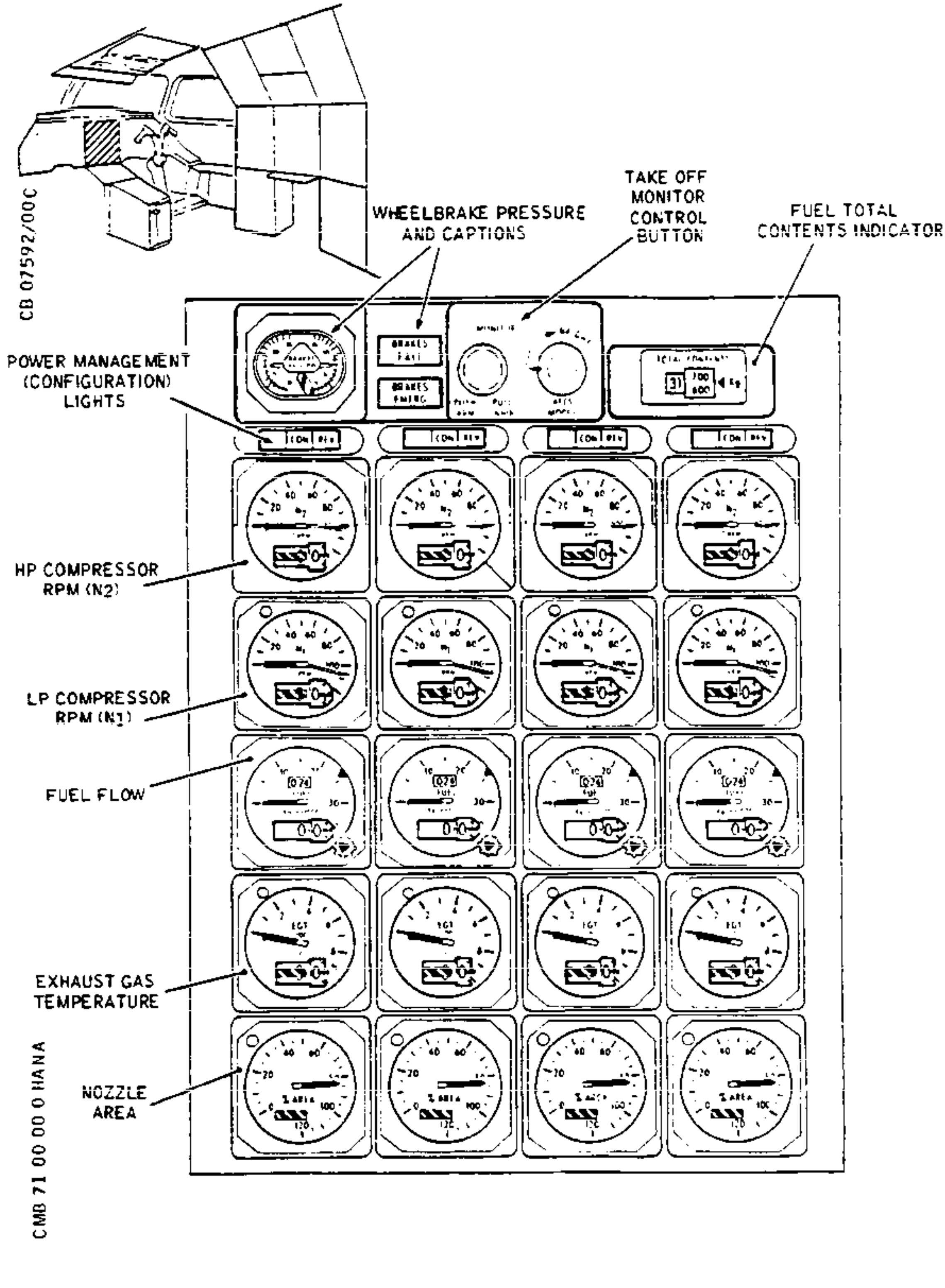
Centre console, panel 9-211 (Ref. Fig.023)
Centre dash, panel 6-211 (Ref. Fig.024)
Dash panels left-hand 2-211 and right-hand 2-212 (Ref. Fig.024)
R Pilots' roof panel 4-211 (Ref. Fig.025 and 025A)
Pilots' roof panel 4-211 (Ref. Fig.026)
3CM Left-hand upper panel 12-214 (Ref. Fig.027)
3CM Pressurization and power management panel 1-214 (Ref. Fig.028)
3CM Intake management panel 13-214 (Ref. Fig.029)
3CM Power management centre panel 4-214 (Ref. Fig.030)
3CM Left-hand lower panels 11-214, 14-214, 18-214, 21-214, 23-214, 25-214 (Ref. Fig.031)
3CM Air bleed and equipment bay cooling panel 2-214 (Ref. Fig.032)
3CM Temperature control panel 2-214 (Ref. Fig.033)
3CM Fuel control panel 5-214 (Ref. Fig.034)
3CM Hydraulic and electrical control panel 3-214 (Ref. Fig.035)
3CM Lower electrical panel 6-214 (Ref. Fig.036)
3CM Fire protection and fire bottle test panels 27-214, 28-214 (Ref. Fig.037)

B. Flight Compartment Safety Check

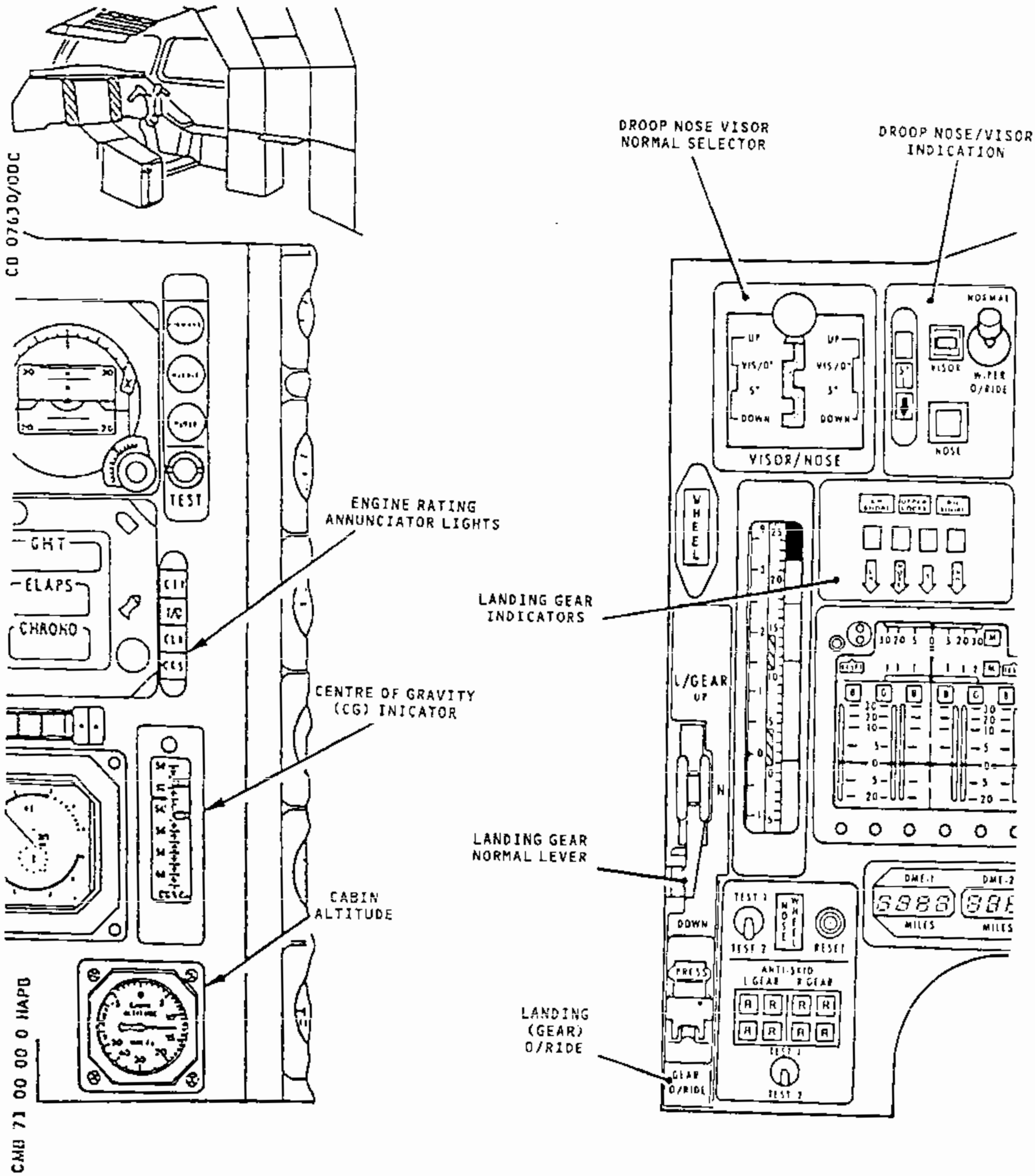
Door inflatable escape slides	-	(6) Check on entry safety pin fitted to arming lever
Circuit breakers, electrical supplies to pilots' seats	-	Tip and secure with safety clips (Ref. Table



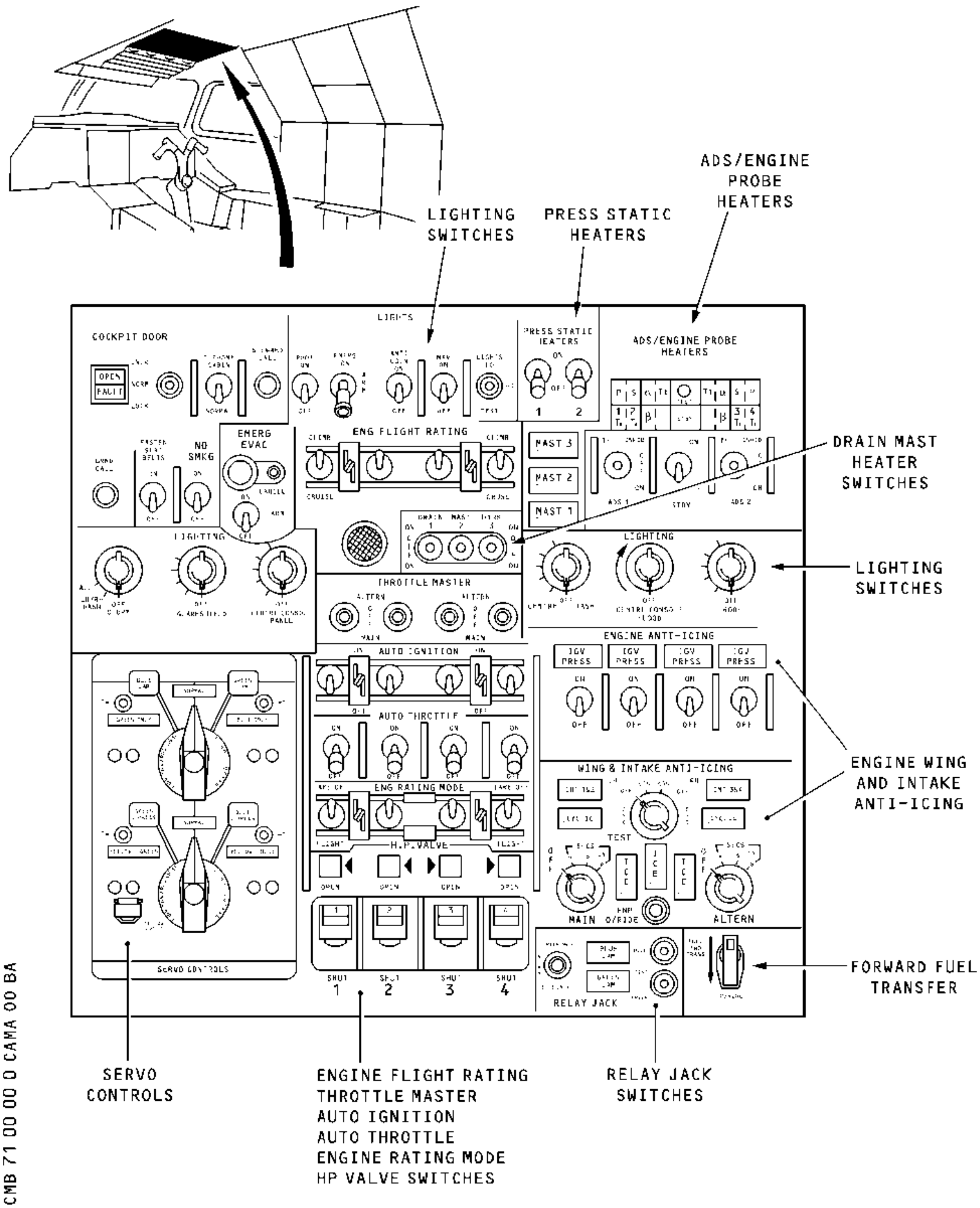
Centre Console Panel 9-211
Figure 023



Centre Dash Panel 6=211
Figure 024

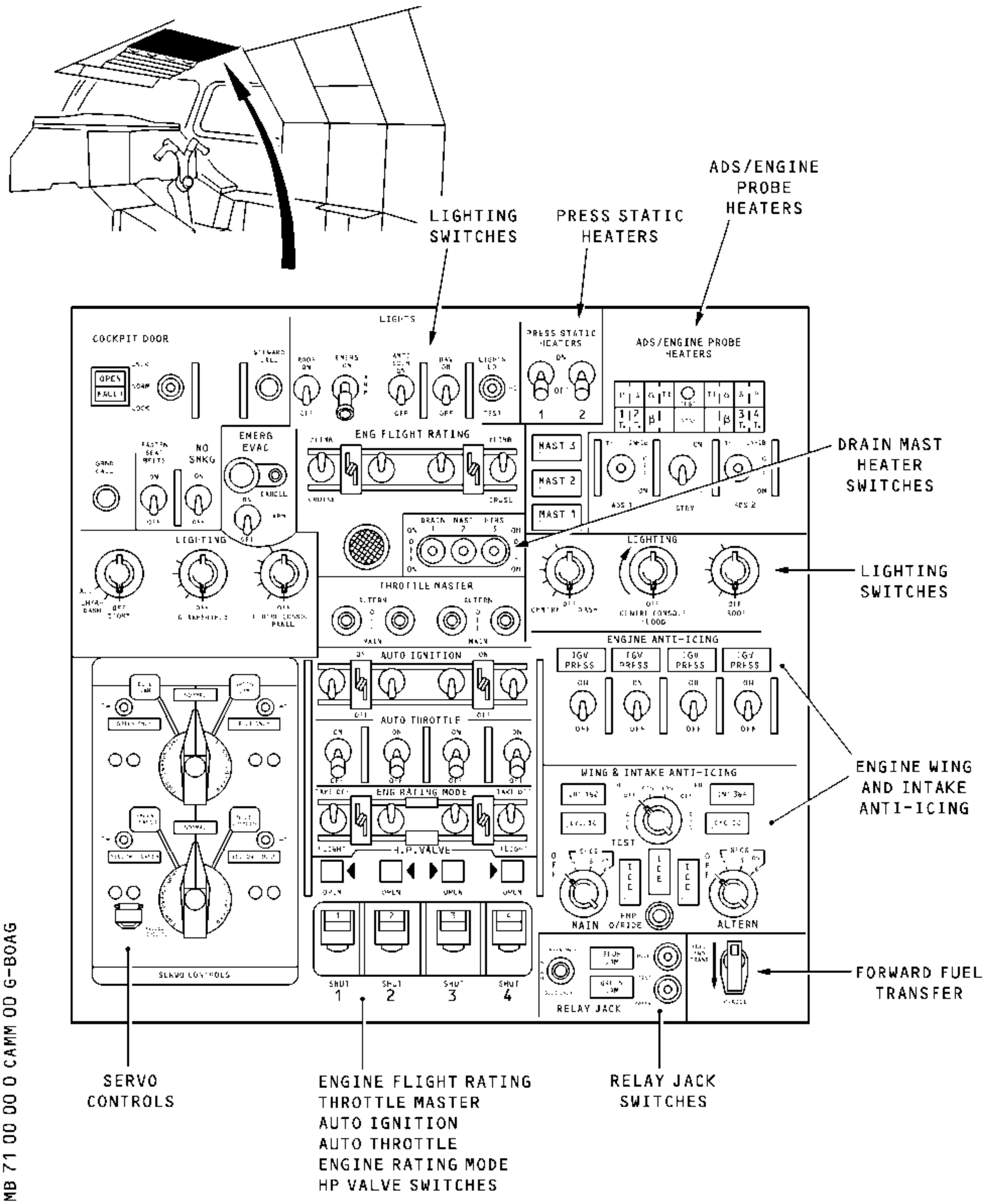


Dash Panels Left-hand 2-211 and Right-hand 2-212
Figure 024



Pilots' Roof Panel 4-211
Figure 025

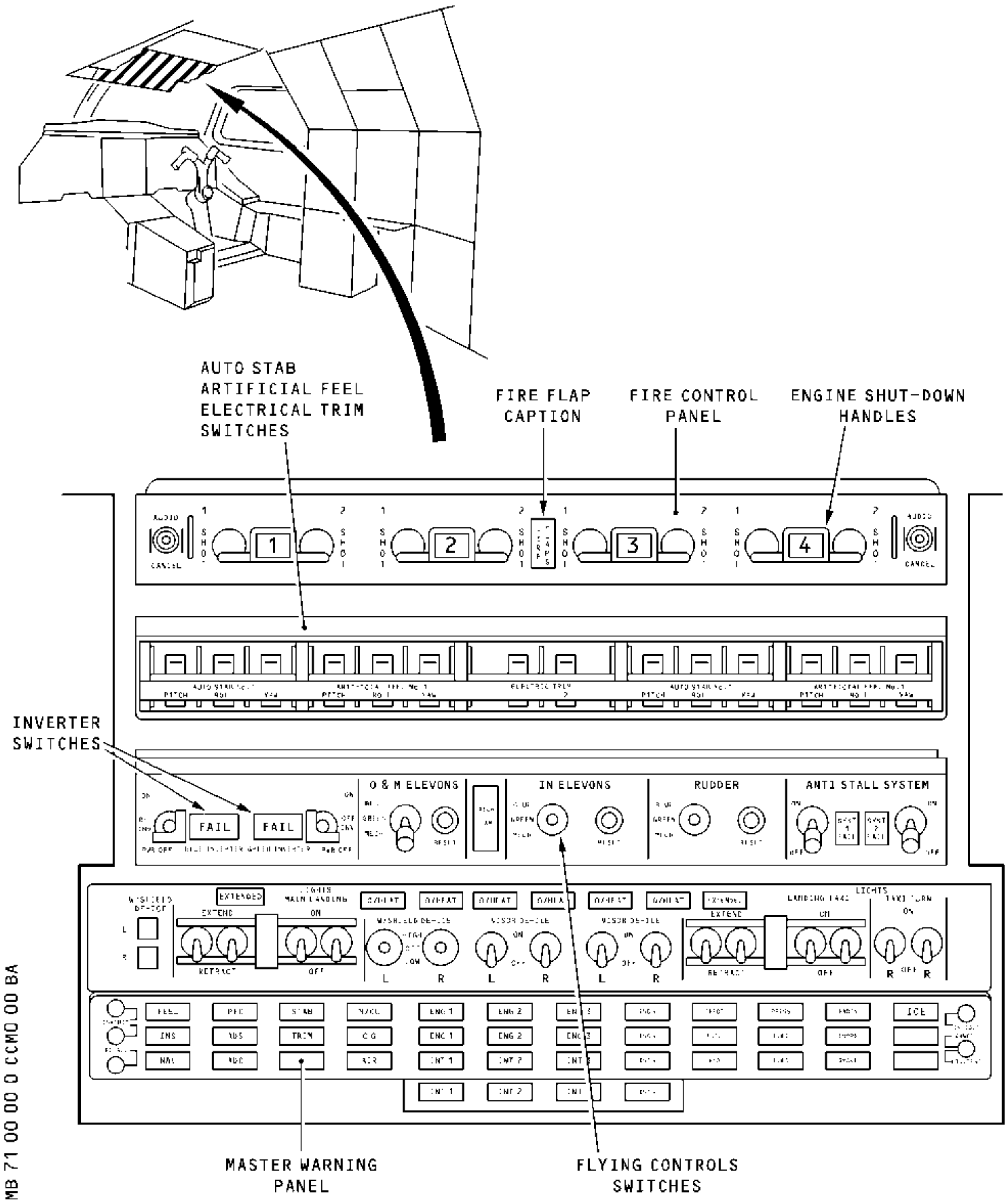
R



CMB 71 00 00 0 CAMM 00 G-BOAG

Pilots' Roof Panel 4-211
Figure 025A

R



Pilots' Roof Panels 4-211
Figure 026

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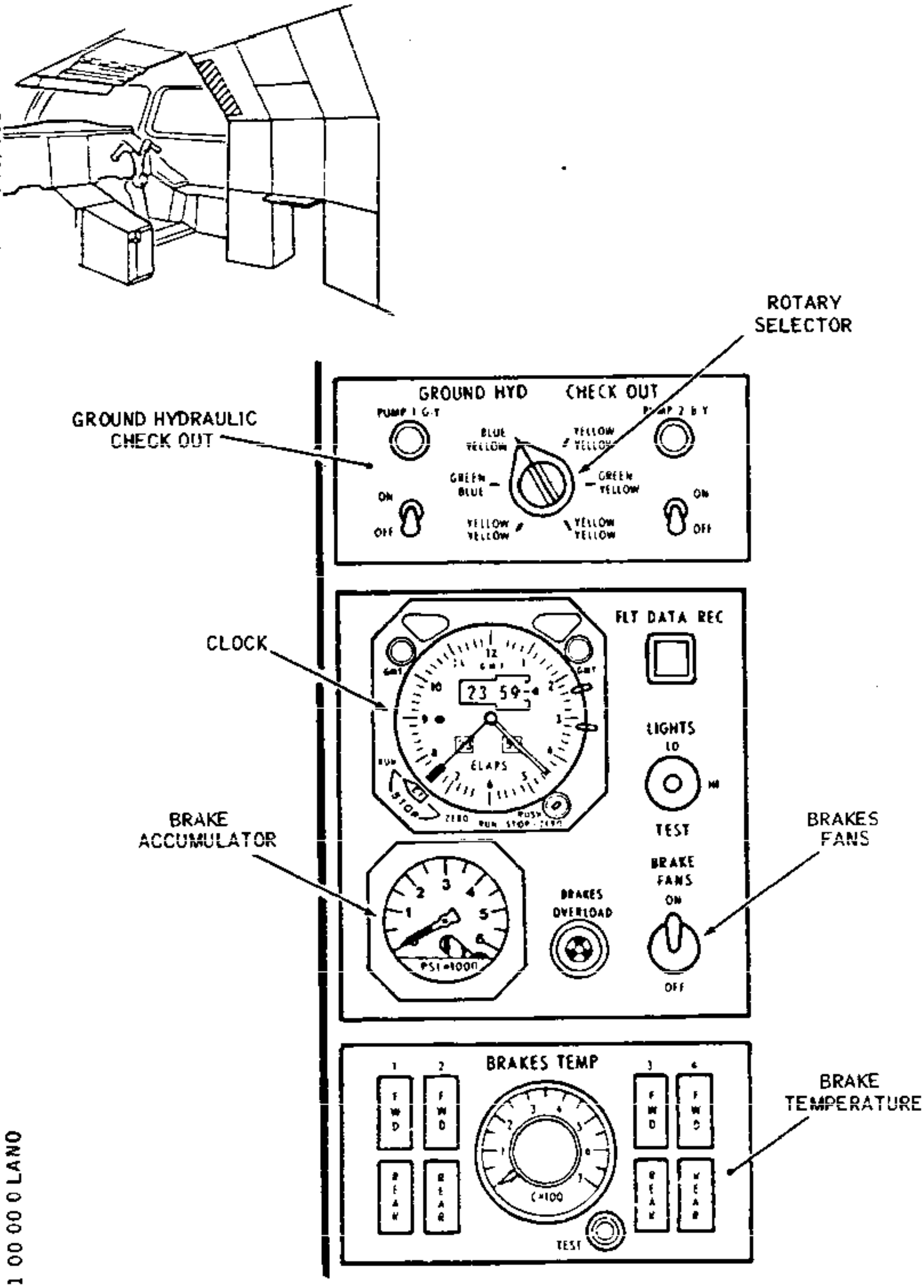
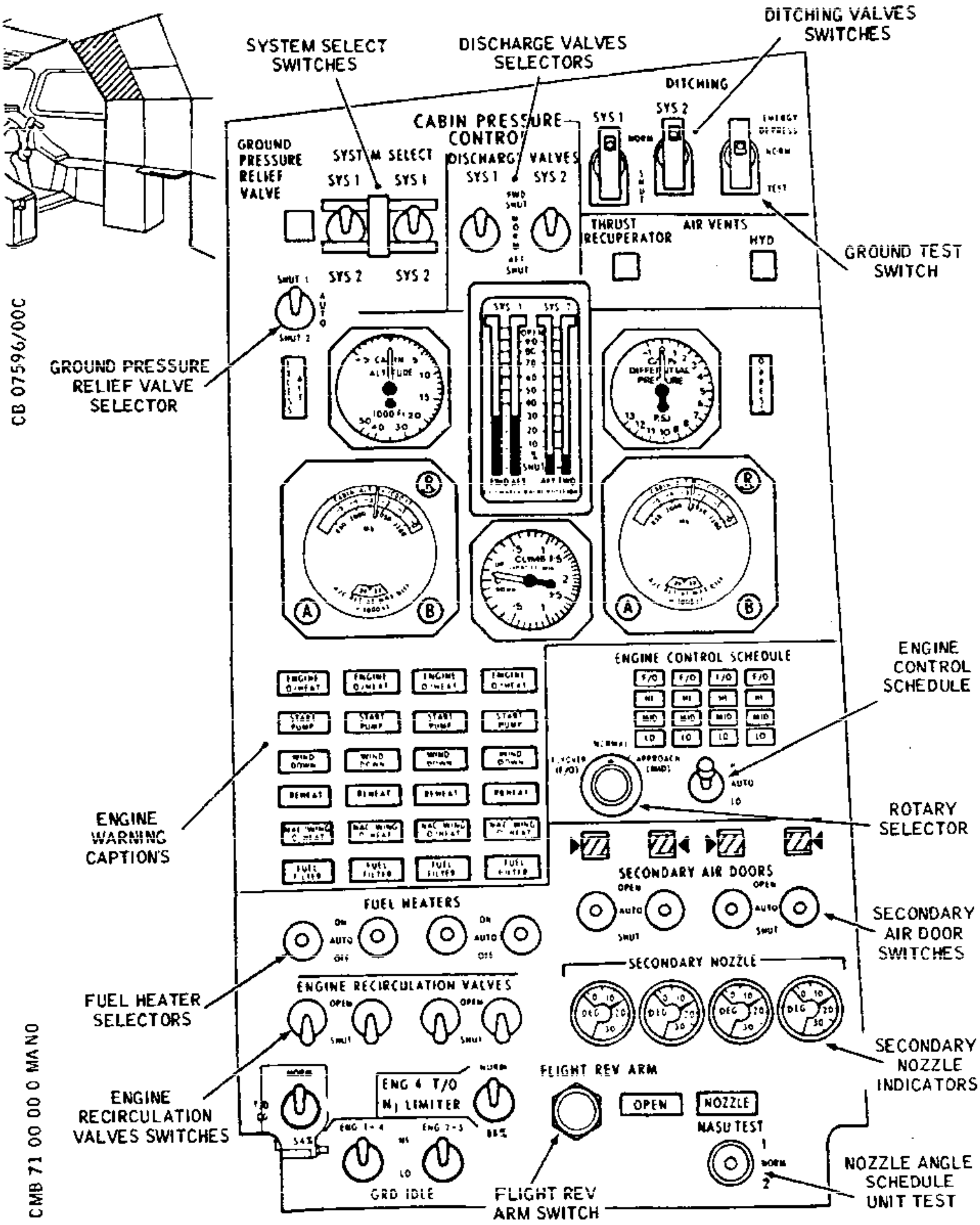
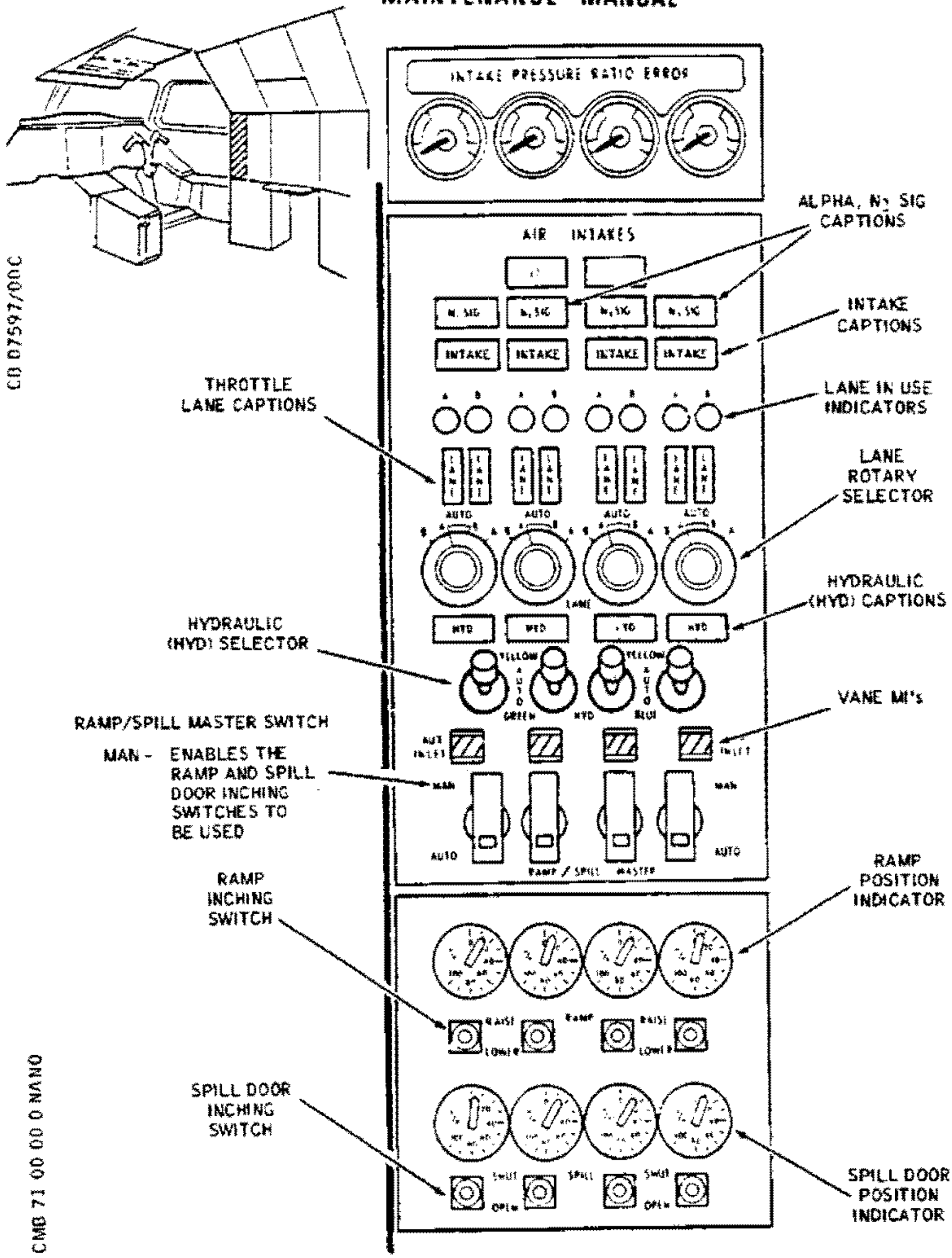


CMB 71 00 00 0 LANO

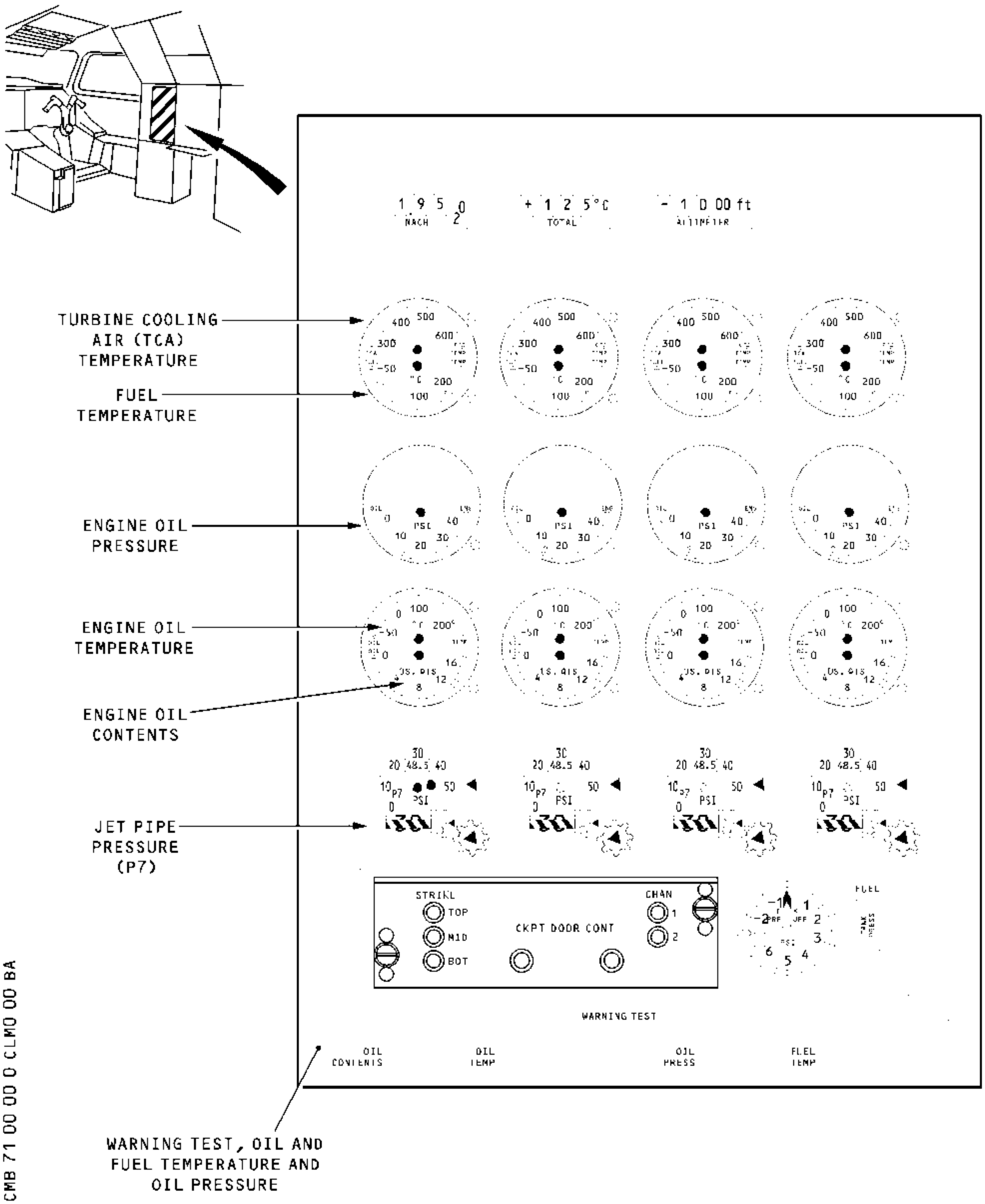
3CM Left-hand Upper Panels 12-214
Figure 027



3CM Power Management 1-214
Figure 028

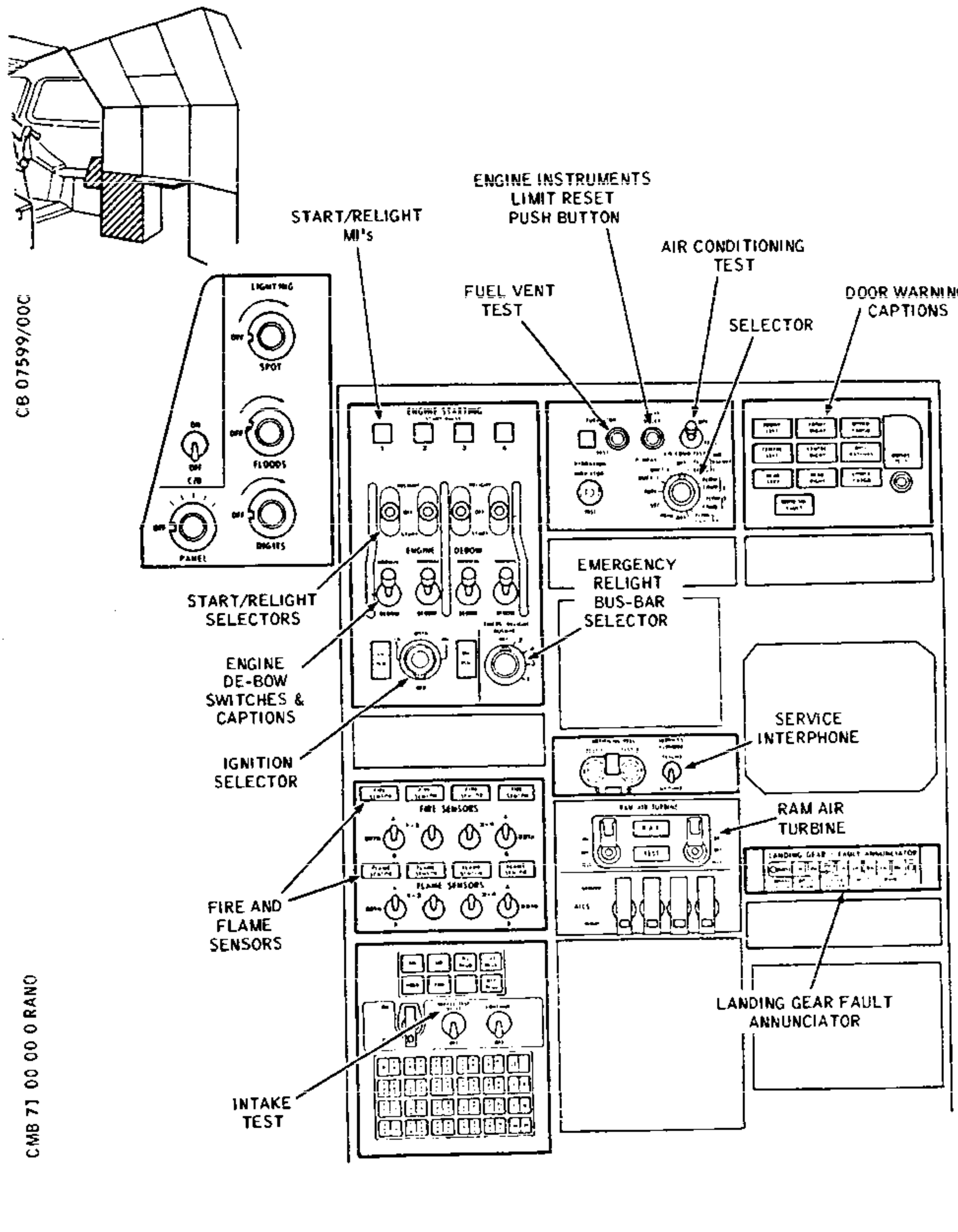


3CM Intake Management 13-214
Figure 029

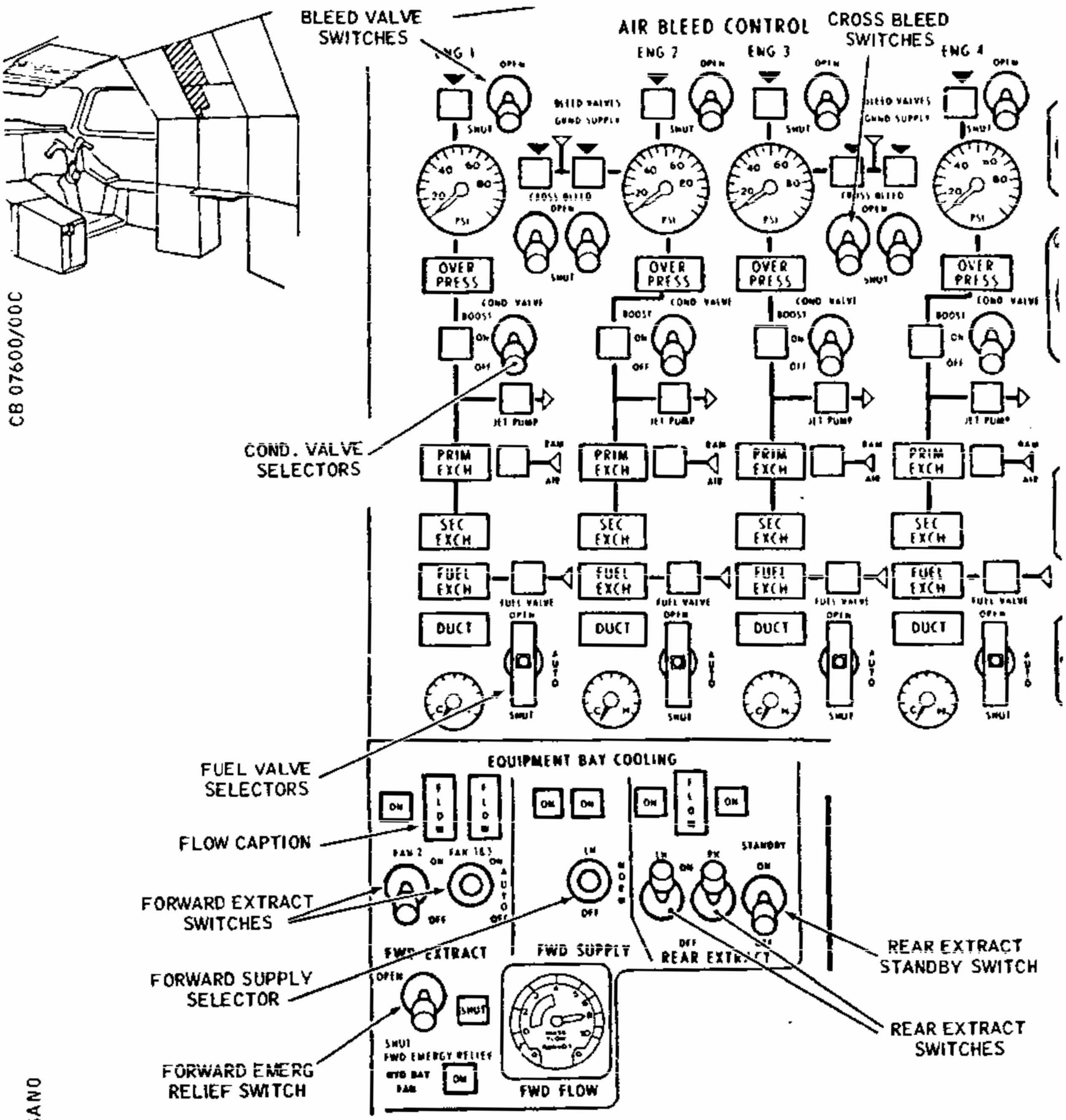


3CM Power Management Centre Panel 4-214
Figure 030

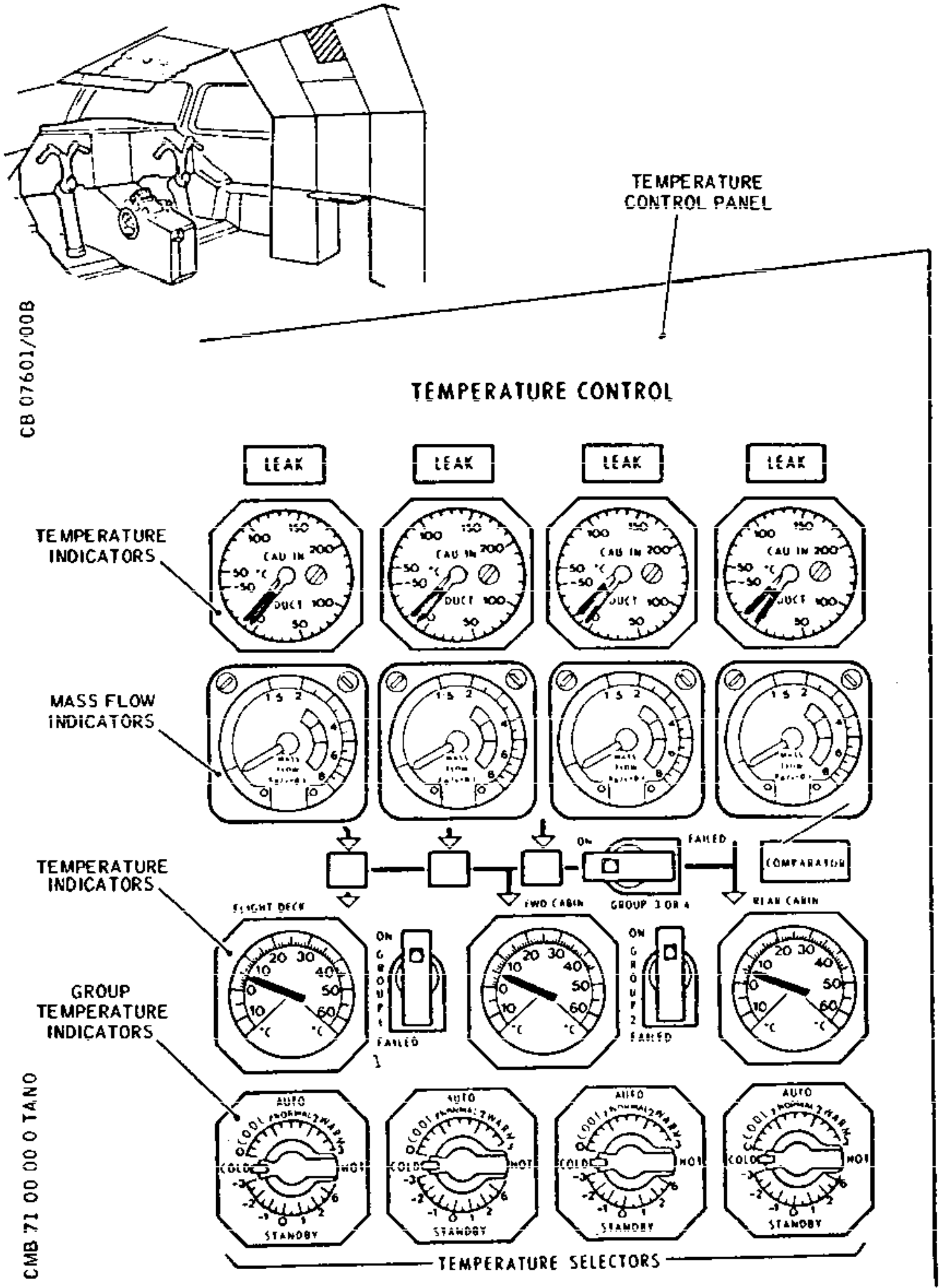
R



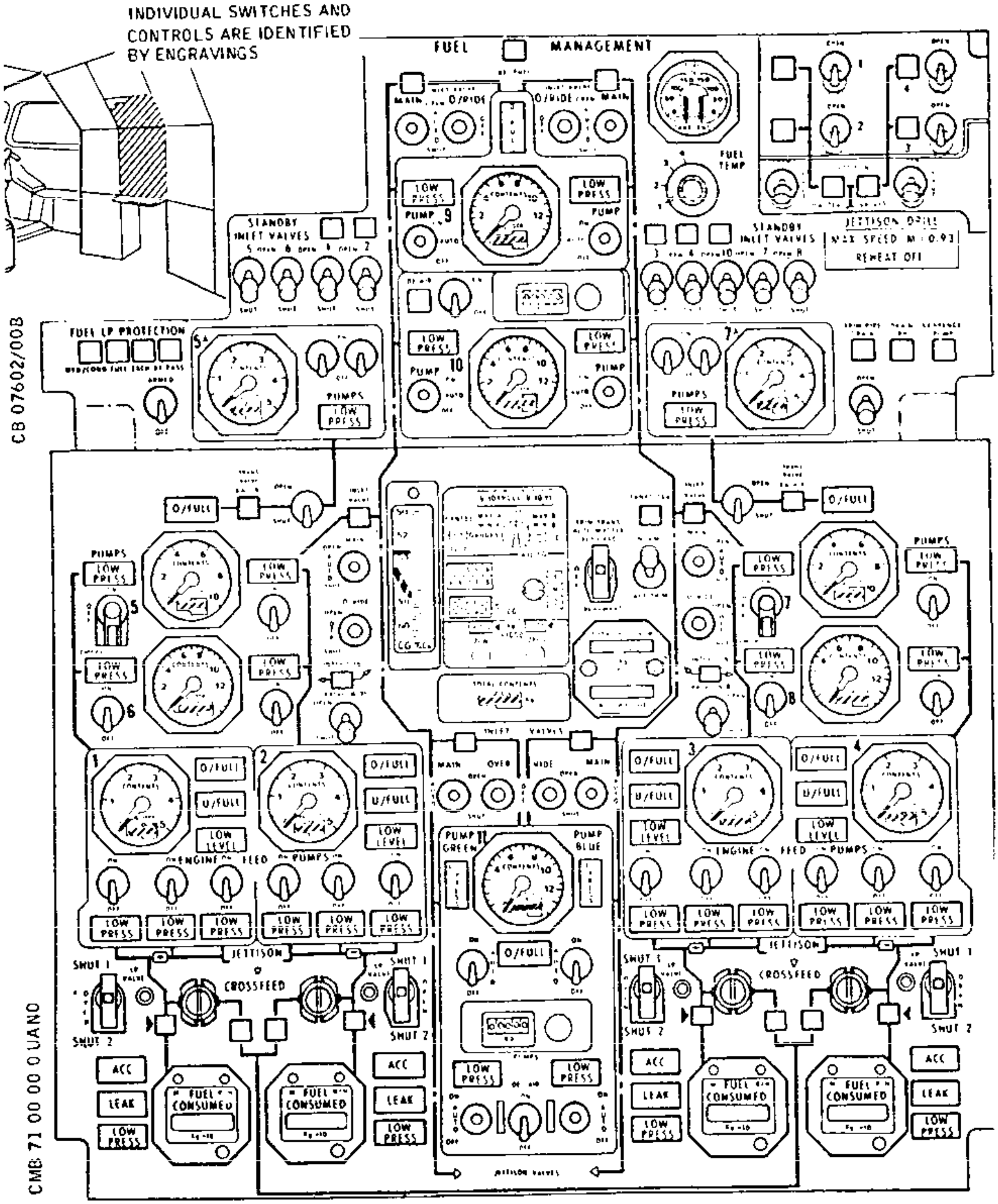
3CM Left-hand Lower Panels 11-214,14-214,18-214,
21-214, 23-214, 25-214
Figure 031



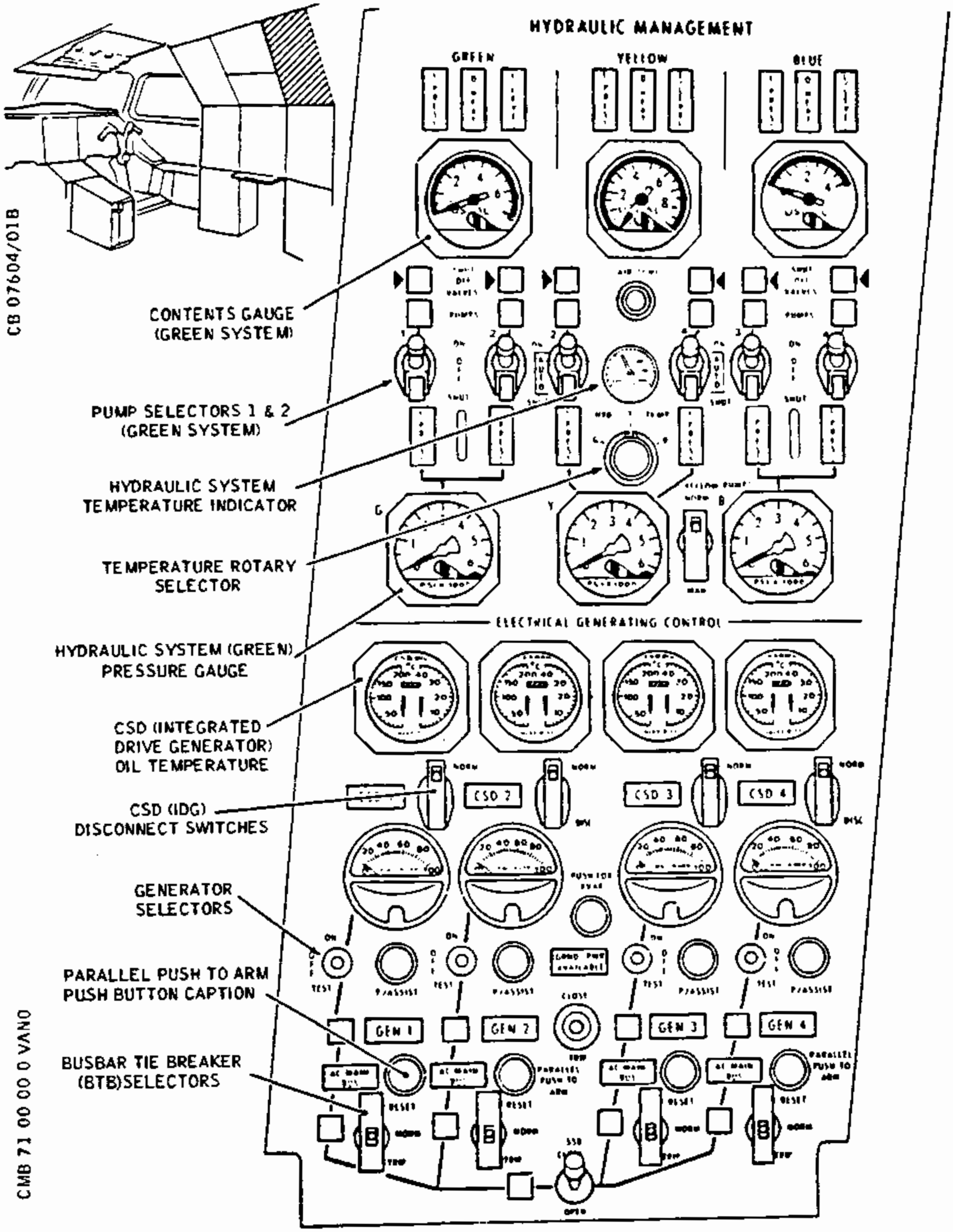
3CM Air Bleed and Equipment Bay Cooling 2-214
Figure 032



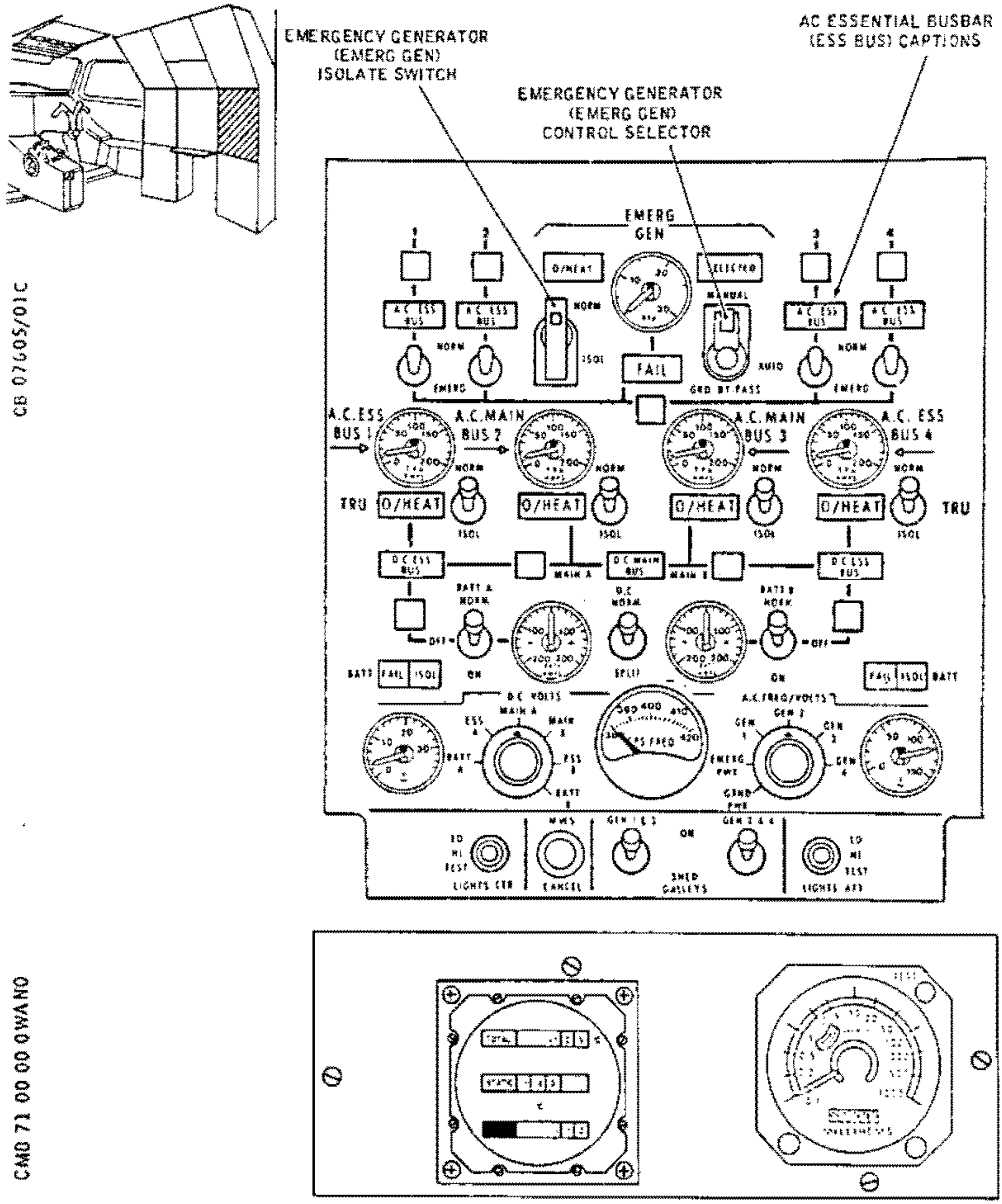
3CM Temperature Management Panel 2-214
Figure 033



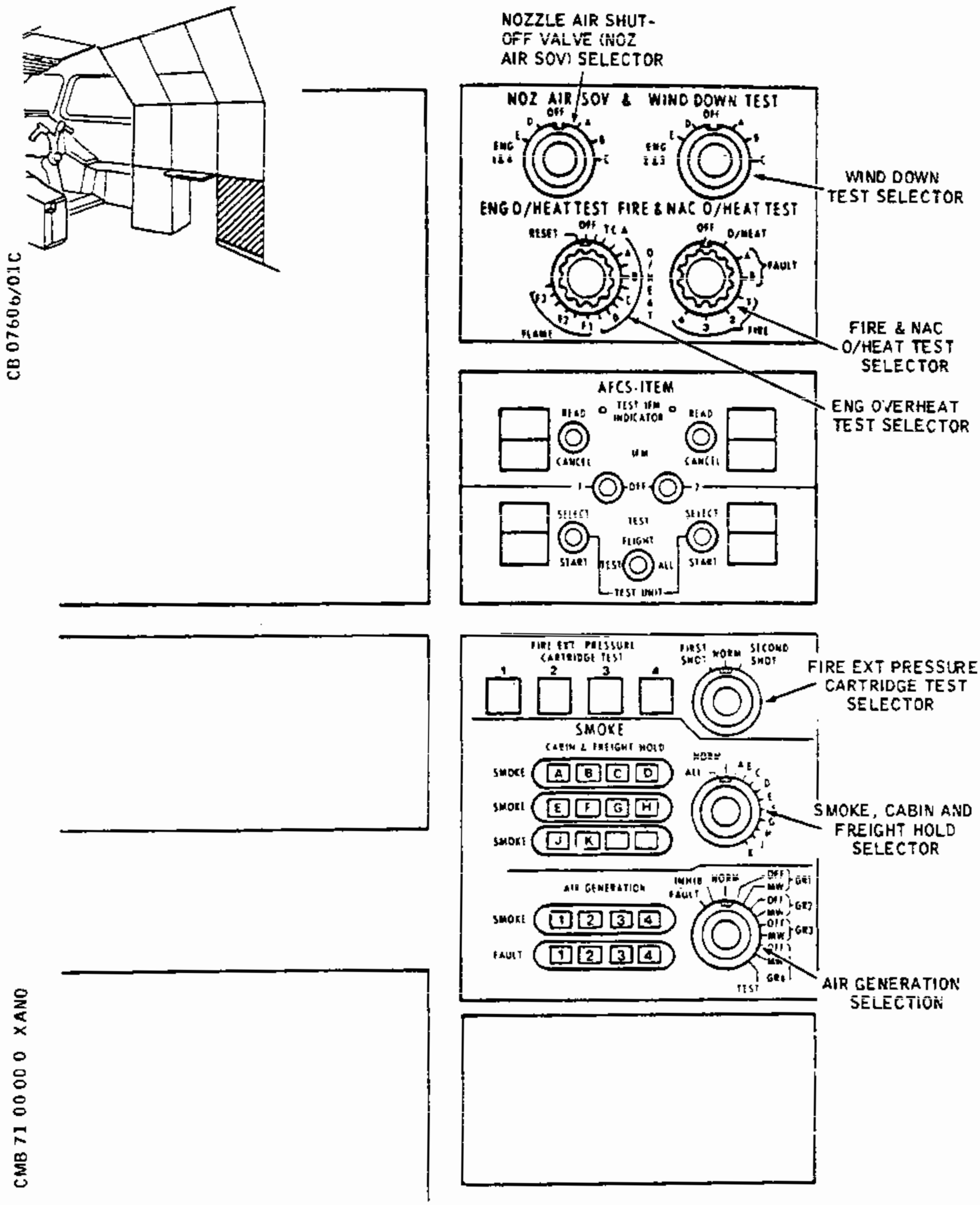
3CM Fuel Management Panel 5-214
Figure 034



3CM Hydraulic and Electrical Management Panel
3-214 and 8-214
Figure 035



3CM Power Management Centre Panel 4-214
Figure 036



R

3CM Right-hand Lower Panels 27-214 28-214
Figure 037

501).

FWD Stewards panel (At the forward passenger door)

Ground Service switch	-	ON
BOARDING, RACKING AREA and ROOF lights	-	ON

Centre Console and Dash panels (Ref. Fig.023 and 024)

Landing gear STANDBY Lowering lever	-	NEUTRAL (UP) cover down
RADAR	-	OFF
Emergency nose/visor uplock release	-	Down/pin engaged
Nose and visor STANDBY	-	OFF/guarded
Brake selector		NORM

NOTE: Parking brakes must be NORM and brakes off when the aircraft is restrained by full tethering equipment. For running on chokes, see Pre-Ground Running notes.

L/GEAR normal lever	-	Down
GEAR O/RIDE		Guarded

NOTE: This check prevents any uncontrolled movement of the droop nose and visor when the green hydraulic system is pressurized.

R Roof panels (Ref. Fig.025, 025A and 026)

AUTO IGNITION switches	-	(4) OFF
HP VALVE		SHUT
PRESS STATIC HEATERS	-	(2) OFF
WING & INTAKE ANTI-ICING test	-	(3) OFF
FUEL FWD TRANS switch		Guarded
DRAIN MAST HEATERS	-	(3) OFF

ADS/ENG PROBE HEATERS

ADS1, ADS2, & STBY	-	(3) OFF

3CM Panel-Fuel (Ref. Fig. 034)

TRIM TRANS AUTO MASTER selector	-	OFF/GUARDED
TANK 11 INLET VALVES, MAIN selectors,	-	(2) AUTO
O/RIDE selectors	-	(2) OFF
JETTISON transparent cover	-	Check, closed
TRIM PIPE DRAIN switch	-	SHUT
STANDBY INLET VALVES switches	-	(9) SHUT

3CM Panel (Ref. Fig. 033)

RAM AIR TURBINE selectors	-	(2) OFF/Guarded
Cabin		
Circuit breakers (required for ground runs)	-	Set all flight deck CBs that are essential for engine ground runs

NOTE: If ground running is to take place with certain aircraft systems unserviceable these must be isolated.

Control panel and circuit breaker panel covers	-	Secure
Hand fire extinguishers	-	Available

NOTE: For high power running when the air stairs are not available the forward two escape slides should be armed.

WARNING: BEFORE CONNECTING ELECTRICAL GROUND POWER TO THE MAIN AC DISTRIBUTION SYSTEM CHECK THAT CBs IDENTIFIED WITH A RED SURROUND ARE TRIPPED.

CAUTION: CHECK THAT CBs IDENTIFIED WITH A WHITE SURROUND ARE TRIPPED EXCEPT FOR CBs ESSENTIAL FOR GROUND RUNNING WHICH MUST BE SET.

C. Checks with Power On (Ref. Fig. 034, 035 and 036)

CAUTION: ENSURE REAR EXTRACT LH AND RH FANS ARE SELECTED ON, AND FORWARD EXTRACT FANS ARE SET TO AUTO AS SOON AS POSSIBLE AFTER GROUND POWER SELECTION.

Request Ground Power On at External Rig

GRND PWR AVAILABLE caption	-	On (white)
Ground power switch	-	Set to CLOSE check

panels illuminate

NOTE: If the panels do not illuminate:

SSB (split system breaker) switches	-	Close MI in-line
BTB (busbar tie breaker, below AC MAIN BUS caption)	=	(4) Lift guards, push selectors to RESET and release
ESS main isolate switches	-	(4) Set to NORM
TRU (Transformer rectifier unit switches)	-	(4) Set to NORM

NOTE: 1. The panels should now illuminate
2. The SSB connects the LH main ac system to the RH main ac system. If the SSB is OPEN, the ground supply is isolated from all except ground supply busbars.'

MWS (master warning system)	-	Push CANCEL,pushbutton
AC MAIN BUS captions (amber)	-	(4) Check OFF

NOTE: If AC MAIN BUS captions are illuminated:

BTB selectors	-	(4) Lift guard push to RESET and release. Check AC MAIN BUS captions are off.
AC ESS Bus captions (red)	-	(4) Check OFF

NOTE: If AC ESS BUS captions are illuminated:

ESS main isolate switches	-	(4) Set to NORM Check AC ESS BUS captions are OFF.
DC MAIN BUS caption (amber) DC ESS Bus caption (red)	-	(2) Check OFF.

NOTE: If DC MAIN BUS caption, or DC ESS BUS captions are illuminated:

TRU switches	-	(4) Set to NORM Check DC MAIN BUS caption and DC ESS BUS captions are OFF.
Battery switches	-	(2) OFF
Battery MI's	-	(2) Crossline and BATT ISOLATE captions (2) amber, illuminated

DC ESS/MAIN split MI's	-	(2) In-line

D. Flight Compartment Checks and Settings

3CM, equipment bay cooling panel (Ref. Fig. 032)

FLOW captions	-	(3) Check, OFF
FWD EMERG RELIEF switch		Set to OPEN, check MI shows OPEN.

NOTE: The forward emergency relief valve permits the flow of rack extract air to the underfloor area, then to the rear discharge valve.

FWD EMERG, RELIEF switch	-	Set to SHUT, check MI shows SHUT.
FWD SUPPLY selector	-	Set to NORM. check LH MI and RH MI show ON
FWD EXTRACT STANDBY switch	-	Set to OFF
FWD EXTRACT MAIN selector	-	Set to AUTO, Check MI shows ON. FWD FLOW gauge reads higher than the amber arc.

NOTE: At AUTO, the two main forward extract fans will run when cabin/ambient differential pressure is lower than 2 psi.

REAR EXTRACT LH and RH switches	-	(2) Set to ON, check MI's show ON.
REAR EXTRACT STANDBY switch	-	set to OFF
HYD BAY FAN MI	=	Check ON

NOTE: When the cabin/ambient differential pressure is lower than 5 psi a fan ventilates the hydraulic bay at the rear of the aircraft, using outside air.

Panel lighting (1st supernumerary)	-	As required

3CM, emergency generator panel (Ref. Fig. 036)

Lights FWD)
Lights CTR)

Lights AFT) selectors	-	Hold at TEST check all warning captions illuminate on 3CM panels. Release selectors.

Centre Console (Ref. Fig.023)

L/GEAR indicator	-	Check 4 greens
ADC 1 & 2 switches	-	(2) OFF

E. Flight Compartment Preparation.

R Pilots' roof panels (Ref. Fig.025, 025A and 026)

I/PHONE switch	-	NORMAL
Lighting	-	(3) As required
ENG FLIGHT RATING switches	-	(4) CLIMB
THROTTLE MASTER selectors	-	(4) MAIN
Selector captions	-	(4) OFF
THROT caption	-	(4) OFF
AUTO THROTTLE switches	-	(4) ON
ENG RATING MODE switches	-	(4) TAKE OFF, Take off caption, white, illuminate
HP VALVE switches	-	(4) SHUT, check MI shows SHUT.
ADS ENGINE PROBE HEATERS	-	(3) OFF
ADS ENGINE PROBE HEATERS lights (yellow)	-	(15) On
LIGHTING CENTRE DASH CENTRE CONSOLE FLOOD ROOF	-	(3) As required
ENGINE anti-icing	-	CHECK/OFF
No. 1 ENGINE ANTI-ICING switch	-	Set to ON
No. 1 engine IGV PRESS caption (amber)	-	illuminated
MWS ENG caption (amber)	-	On and audio (gong)
No. 1 ENGINE ANTI-ICING switch	-	OFF
Repeat for engines 2, 3 and 4		

Engine Shut-down handles	-	(4) Fully in
SHOT 1 and SHOT 2 paper discs	-	(8) Intact
Engine shut-down handle captions	-	(8) Off

NOTE: If captions (red) illuminated check HP VALVE switches are at SHUT.

FIRE FLAPS caption (green) = Off

LIGHTS MAIN LANDING switches	-	(4) OFF and RETRACT
W/SHIELD DE-ICE selectors	-	(2) OFF
DV DE-MIST switches	-	(2) OFF
LIGHTS LANDING TAXI switches	-	(4) OFF and RETRACT
CANCEL LTS TEST push button	-	Press, check all MWS captions illuminated, release check all off.
INHIBIT pushbutton	-	Press, check INHIBIT captions (2, amber) on.
CANCEL LTS TEST pushbutton	-	Press, check MWS captions, ADS, TRIM, PFC ENG 1, ENG 2 ENG 3 and ENG 4 (red) illuminated.

NOTE: This test confirms the inhibit facility

		Release, check all MWS captions off.
RECALL pushbutton		Press, check MWS captions indicate correct system status and the inhibit captions (2) are off.
CANCEL LTS TEST push button	-	Press release check all MWS captions, illuminate then off.

Engine starting panel (Ref. Fig. 031)

START/RELIGHT selectors	-	(4) OFF
START/VALVE MI's	-	(4) OFF
DEBOW switches	-	(4) NORMAL
DEBOW switch (yellow)	-	(4) Off

Ignition selector	-	Both or RH or LH
LH IGN and RH IGN captions	-	Off
EMERG RELIGHT BUSBARS selector	-	OFF

3CM, fire sensor panel (Ref. Fig. 031)

FIRE SENSORS selectors	-	(4) BOTH
FIRE SENSOR captions	-	(4) OFF, if illuminated (amber) set FIRE & NAC O/HEAT TEST selector at OFF, check captions off.
FLAME SENSOR selectors	-	(4) BOTH
FLAME SENSOR LT	-	(4) Off

3CM, air conditioning test panel (Ref. Fig. 031)

FUEL VENT ignition protection MI	-	FULL
FUEL VENT TEST pushbutton	-	Press & hold, check MI shows DIS, release check MI shows FULL
LIMIT RESET pushbutton	-	Press, check N1, N2, and fuel tank pressure pointers are reset.
AIR COND TEST switch	-	OFF
AIR COND TEST selector	-	OFF
DOOR SW FAULT caption	-	OFF

3CM, engine overheat test panel (Ref. Fig. 037)

NOZ AIR SOV & WIND DOWN TEST selectors	-	OFF

NOTE: An Operational test of the Bucket Control System and Buckets is contained in (78-00-00, Adjustment/ Test para 3).

ENG O/HEAT TEST selector	-	Set to F1, Check ENG O/HEAT captions (4) (red) and MWS ENG. captions (4) (red) and (4) (amber) illuminate and audio (gong)

ENG O/HEAT TEST selector	-	To position between F1 and F2, check after 5 seconds, ENG O/HEAT captions (4) and MWS ENG captions (8) OFF.

NOTE: The selector must remain at the reset position for five seconds to be effective.

ENG O/HEAT TEST selector	-	To F2, check ENG O/HEAT captions (4)(red) and MWS ENG captions (4) (red) and (4)(amber) illuminate and audio (gong).
ENG O/HEAT TEST selector	-	To position between F2 and F3, check after 5 seconds, ENG O/HEAT captions (4) and MWS ENG captions (8) Off.
ENG O/HEAT TEST selector	-	To F3, check ENG O/HEAT captions (4) red and MWS ENG captions (4) (red) and (4) (amber) are illuminated and audio (gong)
ENG O/HEAT TEST selector	-	To position between F3, and No.4 BEARING TEST, check after 5 seconds ENG O/HEAT captions (4) and MWS ENG captions (8) off.
ENG O/HEAT TEST selector	=	To RESET, check ENG O/HEAT captions (4) and MWS captions (4) off
ENG O/HEAT TEST selector	-	OFF
FIRE & NAC O/HEAT TEST selector	-	To O/HEAT check, NAC/ WING caption (4) (amber) and MWS ENG caption (4) (amber) illuminated and audio (gong)

NOTE: There is no test for the wing overheat detection systems.

FIRE & NAC O/HEAT TEST selector	-	To Fault A, check FIRE SENSOR captions (4) and MWS ENG captions (4) (amber) illuminate and audio (gong)
FIRE SENSORS selectors	-	(4) to B, check FIRE SENSOR captions (4) and MWS ENG captions off.
FIRE & NAC O/HEAT TEST selector	-	To Fault B, check FIRE SENSOR captions (4) (amber) and MWS ENG captions (4) (amber) illuminate and audio (gong)
FIRE SENSORS selectors	-	To A, check FIRE SENSOR captions (4) and MWS ENG captions (4) off.
FIRE SENSORS selectors	-	(4) to BOTH, check FIRE SENSOR captions (4) (amber) and MWS ENG captions (4) (amber) illuminate and audio (gong).
FIRE & NAC O/HEAT TEST selector	-	To FIRE 1, check FIRE SENSOR captions OFF, No. 1 engine shut-down handle captions (2) (red) flashing, MWS ENG 1 caption (red) illuminate, audio (gong) and distinctive fire audio (bell)
FIRE & NAC O/HEAT TEST selector	-	To FIRE 2, check
	-	FIRE SENSOR captions off, No. 2 engine shut-down handle captions (2) (red) flashing, MWS ENG 2 caption (red) on audio (gong) handle and distinctive fire audio (bell) No. 1 engine shut-down caption (4) and MWS ENG 1 caption off.

NOTE: Repeat the last test to test FIRE 3 and FIRE 4.

FIRE & NAC O/HEAT TEST selector	-	To OFF, check No. 4 Engine shut-down handle caption (2) and MWS ENG 4 caption off.

3CM, fire extinguisher test panel (Ref. Fig. 037)

FIRE EXT PRESSURE CARTRIDGE TEST selector	-	NORM, check MI's (4) show FULL.
FIRE EXT PRESSURE CARTRIDGE TEST selector	-	To FIRST SHOT, check MI's (4) show DIS
FIRE EXT PRESSURE CARTRIDGE TEST selector	-	NORM. check MI's (4) show FULL.
FIRE EXT PRESSURE CARTRIDGE TEST selector	-	To SECOND SHOT, check MI's (4) show DIS
FIRE EXT PRESSURE CARTRIDGE TEST selector	-	NORM, check MI's (4) show FULL
SMOKE CABIN AND FREIGHT HOLD and AIR GENERATION selectors	-	NORM, check SMOKE (16) FAULT (4) and MWS SMOKE captions OFF.
SMOKE CABIN AND FREIGHT HOLD selectors	-	ALL, check SMOKE A,B,C, D,E,F,G,H,J and K (10) (amber), MWS SMOKE (amber) captions illuminated and audio (gong).
SMOKE CABIN AND FREIGHT HOLD selector	-	NORM, check SMOKE (10) and MWS SMOKE captions off.
AIR GENERATION selector	-	NORM, check SMOKE 1,2, 3,4 and FAULT 1,2,3 and 4 captions off.

3CM, Ground hydraulic check-out panel (Ref. Fig. 027)

PUMP 1G-Y and PUMP 2 B-Y switches	-	(2) Off
Rotary selector		YELLOW/YELLOW

3CM, clock panel

Clock	-	Set, if failure caption (red) is illuminated pull and release GMT knob.

NOTE: To set the minutes, pull and turn clockwise the GMT PULL TO SET knob. To set the hours, pull and turn clockwise the HRS knob. The two knobs will operate only in the clockwise direction.

The elapsed time counter is operated by a three-position lever. Moving the lever from STOP to RUN starts the counter and moving it back to STOP, stops the counter. To reset, move the lever to RESET; from RESET the lever is spring-loaded to STOP.

The short-term timer is controlled by an EVENT push button.

Brakes accumulator	-	Check, 3050 to 3150 psi
BRAKES FANS	-	OFF

NOTE: If brake pressure less than 3050 psi switch on a ground hydraulic check-out pump; YELLOW/YELLOW.

3CM, Intake Control Panel (Ref. Fig. 029)

N1 SIG captions (amber)	-	(4) Illuminated
INTAKE captions (red)	-	(4) Illuminated
Lane in use A and B (green)	-	(8) Off.
LANE captions (amber)	-	(8) OFF.
Lane selectors	-	(4) AUTO A or AUTO B
HYD captions (amber)	-	(4) Illuminated
HYD selector	-	(4) AUTO
VANE MI's	-	(4) Check agree with the position of the vanes observed during the external check.
RAMP/SPILL MASTER switches	-	(4) MAN
RAMP indicators		(4) 0%
RAMP inching switches	-	(4) OFF
SPILL indicators	-	(4) 0%
SPILL inching switches	-	(4) OFF

3CM, Cabin Pressure Control Panel (Ref. Fig. 028)

GROUND PRESSURE RELIEF VALVE selector	-	AUTO, check MI shows OPEN.
System select switches	-	(2) SYS 2
DISCHARGE VALVES,SYS 1 and SYS selectors		NORM
DITCHING VALVES SYS 1 and SYS 2 switches	-	NORM and guarded
EMERG DEPRESS switch	-	NORM and guarded
THRUST RECUPERATOR MI	-	Shows OFF
AIR VENTS HYD MI	-	Shows OPEN
Engine warning captions		
Engine O/HEAT)	-	(4) Off
START PUMP)	-	(4) Off
WIND DOWN)	-	(4) Off
REHEAT)	-	(4) Off
NAC/WING/O/HEAT) captions	-	(4) Off
FUEL FILTER captions	-	(4) Press to test,one at a time. Check FUEL FILTER, MWS ENG (amber) captions illuminate and audio (gong)
FUEL HEATERS selectors	-	(4) AUTO
ENGINE RECIRCULATION VALVES switches	-	(4) SHUT
ENGINE CONTROL SCHEDULE selector	-	LOW
Rotary selector	-	NORMAL, check ENGINE CONTROL SCHEDULE LO caption (4)(green) illuminate.
SECONDARY AIR DOOR switches	-	(4) AUTO, check MI's (4) show SHUT, if not select SHUT.
Secondary Nozzle indicators	-	(4) Check all 21 deg. approximately.
Flight rev arm		OFF, check FLIGHT REV ARM OPEN caption Off.
ENG 4 T/O N1 LIMITER	-	NORM
GRD IDLE switch	-	HI

3CM, Engine instruments panel (Ref. Fig. 030)

TCA TEMP pointers	-	(4)	At sensible values
TCA TEMP warning	-	(4)	off.
FUEL TEMP pointers	-	(4)	Above minus 35 deg C
FUEL TEMP warning lights	-	(4)	off.
OIL ENG pointers	-	(4)	0 psi
Low OIL ENG warning lights (red)	-	(4)	on.

NOTE: The engine shut-down handle captions (red) (steady) are inhibited when the associated HP VALVE switch is at SHUT.

OIL TEMP pointers	-	(4)	Above minus 35 deg C
High OIL TEMP warning lights	-	(4)	off.
OIL CONT pointers	-	(4)	More than 6 US QTS
High OIL CONT warning lights	-	(4)	off.
P7 pointers	-	(4)	At sensible values and agree with their lower digital readouts. No warning flags visible. (gong)

R NOTE: There are two levels of warning, 5 in/sec and 10 in/sec.
R The 5 in/sec warning is an amber caption, the 10 in/sec warning is a
R white caption. Both levels of warning are being checked by this test.

R INTENTIONALLY BLANK

R

Warning test (engine instruments)		
OIL CONTENTS WARNING TEST push button	-	Inoperative
OIL TEMP WARNING TEST push button	-	Press, check OIL TEMP gauges (4) warning lights (amber) illuminated, MWS ENG captions (4) (amber) illuminated and audio (gong)
FUEL TEMP WARNING TEST push button	-	Press, check FUEL TEMP gauges (4) warning lights illuminate (amber)

3CM, Air bleed control panel (Ref.Fig.032)

DUCT captions	-	(4) Off
FUEL EXCH captions	-	(4) Off
SEC EXCH captions	-	(4) Off
PRIM EXCH captions	-	(4) Off
OVER PRESS captions	-	(4) Off
BLEED VALVES switches	-	(4) SHUT
OVER PRESS captions	-	(4) Press to test in turn check OVER PRESS caption (amber) illuminate, MWS AIR caption (amber) illuminate and audio (gong).
BLEED VALVE MI's	-	(4) Cross-line
Bleed pressure gauges	-	(4) show 0 approx
CROSS BLEED switches	-	(4) Check SHUT
CROSS BLEED MI's	-	Cross-line
COND VALVE selectors	-	(4) Check OFF
COND VALVE MI's	-	(4) Show cross-line

NOTE: With COND VALVE selectors at OFF, the cond valve is shut, thus isolating the air conditioning group from the air supply.

JET PUMP MI's	-	(4) Check cross-line

RAM AIR MI's	-	(4) Check in-line
FUEL VALVE selectors	-	(4) Check AUTO & guarded and FUEL VALVE MI's (4) show in-line or cross-line

NOTE: With FUEL VALVE selectors at AUTO, the fuel flow through the heat exchanger is controlled by a controller, using the temperature of the fuel and of the conditioning air upstream and downstream of the fuel/air heat exchanger.

On the ground, any valve may be in either position, depending upon the respective fuel and air temperatures.

TEMP VALVE position indicators	-	(4) Check show C approx.
3CM, Equipment bay cooling panel (Ref. Fig. 032)	-	Check switches and selectors set
3CM, Fuel management panel refuel	-	(Ref 12-11-28)

3CM, Temperature control panel (Ref. Fig. 033)

Group 1, 2, 3 & 4 temperature selectors	-	AUTO and NORMAL

3CM, Hydraulic management panel (Ref. Fig. 035)

Green, Yellow and Blue systems reservoirs L/PRESS captions	-	(3) Off

NOTE: One cycle of the air compressor is normally sufficient to pressurize the three reservoirs. It will operate until either reservoir pressure is sufficient or approximately 3 minutes have elapsed.

CAUTION: AFTER OPERATING THE AIR COMPRESSOR TWICE, WAIT 10 MINUTES COOLING TIME BEFORE OPERATING AGAIN.

Green, Yellow and Blue systems		
O/HEAT captions	-	(3) Off
L/LEVEL captions	-	(3) Off
Green, Yellow and Blue systems reservoir contents gauges	-	(3) Check pointer

		within the green band, and no failure flags
SHUT OFF VALVES MI's	-	(6) Show OPEN, if not check engine driven pump selectors not at SHUT.

NOTE: The shut-off valve upstream of each engine driven pump is normally open.

Green system pump selectors 1 and 2	-	(2)
Blue system pump selectors 3 and 4	-	(2) OFF, guarded and the MI's show OFF
YELLOW PUMPS switch	-	NORMAL, guarded
Yellow system pump selectors 2 & 4	-	AUTO, guarded, MI's show ON
Hyd temperature, on one of the reservoirs	-	Check in normal range

NOTE: Normal hyd temperature range is below 60 deg C.

TEMPERATURE rotary selector	-	Repeat temp check for the other two reservoirs
Hydraulic pump L/PRESS captions (amber)	-	(6) On

NOTE: L/PRESS captions monitor the pressure downstream of the engine-driven pumps and are on because the engines are not running.

GREEN, YELLOW and BLUE systems pressure gauges	-	(3) 0 and no failure flags

3CM, Electrics panel (Ref. Fig.035 and 036)

CSD oil temperature gauges	-	(4) Captions off, no failure flags
CSD disconnect switches	-	(4) NORM, guarded and wirelocked
CSD captions (amber)	-	(4) On
KW, KVAR Meters	-	(4) 0
Generator selectors	-	(4) ON

Generator control breaker MI's	-	(4) Cross-line

NOTE: 1. This state will continue until minimum control conditions are reached after engine start.
2. The MWS CANCEL will need to be operated after each amber caption has been tested.

Generator captions (amber)	-	(4) On
AC MAIN BUS captions	-	(4) Press one at a time, check AC MAIN BUS (amber), MWS ELEC (amber) captions On and audio (gong)
Parallel PUSH TO ARM push button caption (clear)	-	Check-disarmed
BTB selectors	-	(4) NORM, guarded
BTB MI's	-	(4) In-line
SSB MI	-	In-line

NOTE: The SSB must be closed or no supply will be available to the flight compartment.

Ess main isolate MI's	-	In-line
AC ESS BUS captions	-	(4) Press, one at a time, check AC ESS BUS captions (red), MWS ELEC (red) captions illuminated and audio (gong).
EMERG GEN isolate switch	-	NORM, guarded

NOTE: The NORM position arms the emergency for subsequent automatic operation.

EMERG GEN control selector	-	AUTO
EMERG GEN O/HEAT caption	-	Press, check O/HEAT (red), MWS ELECT (red) captions illuminated and audio (gong)
EMERG GEN SELECTED caption	-	Off
EMERG GEN FAIL (yellow) caption	-	Off
EMERG GEN KVA meter	-	0
Auto shed breaker MI	-	Cross-line
No 1, 2, 3 and 4 dc ammeters	-	Indicate loads, if not check TRU switches

(4) at NORM

NOTE: The four TRU's are identical. The dc busbars supplied by them are normally connected together but the TRU ammeter readings may differ.

TRU O/HEAT captions	-	(4) Press one at a time check TRU O/HEAT (yellow) caption illuminated, check ess main split MI's (2) in-line
DC ESS BUS captions	-	(2) Press, one at a time check DC ESS BUS captions (red) illuminated, MWS ELEC (red) illuminated and audio (gong)
DC MAIN BUS caption	-	Press, check DC MAIN BUS (amber), MWS ELECT (amber) captions illuminated and audio (gong)
Left hand battery selector	-	To BATT ON, then to BATT OFF, check BATT ISOLATE (amber), MWS ELECT (amber) captions illuminate and audio (gong)
Right hand battery selector	-	To BATT ON, then repeat the above test
GEN 1 and 3) GEN 2 and 4) GALLEY switches	-	(2) SHED GALLEYS
WATER HTRS switch	-	OFF

3CM, Fuel panel (Ref. Fig. 034)

REFUEL MI	-	FLT

NOTE: FLT indicates that the REFUEL MASTER selector is set to OFF/DEFUEL and the refuelling access panel is closed, isolating the refuel panel from the aircraft fuel system.

Tanks 1, 2, 3, 4 and 10 standby inlet valves MI's	-	SHUT
SCAVENGE PUMP MI	-	Check, does not show on permanently

NOTE: The scavenge pump may be running due to normal leakage of fuel into the vent system. The MI must be monitored to ensure that the pump switches off at intervals.

FQI (Fuel quantity indicators) tank Nos. 1 to 8 - Check do not show failure flags

FQI tank Nos.9, 10 and 11 - Check digital indicators not obscured.

FQI test rotary selector - To GAUGES, check individual tank quantities and TOTAL FUEL are adequate for the engine(s) ground run

Pilots' Dash panels (Ref. Fig. 024)

Temperature indicator - No failure flag

CG indicator - No failure flag and readings to agree with CG indicator at 3CM position

Cabin altimeter - Check, sensible reading

T/O MONITOR control button - PULL INHIBIT

NOTE: PULL INHIBIT dis-arms the power management lights until they are required for engine thrust monitoring.

Fuel TOTAL CONTENTS indicator = No failure flag and quantity to be adequate for engine runs.

CAUTION: CHECK THAT NO REAR TRANSFER OCCURS AND THAT FORWARD CONTENTS ARE MAINTAINED SUFFICIENT TO ENSURE A SAFE CG THROUGHOUT ENGINE RUN.

Engine indication

Power management captions - (12) Off

N2 pointers and digital counters - (4) 0, overlimit pointers at 110% and no flags over digital counters

N1 pointers and digital counters - (4) 0, overlimit pointers, at 108.5%

		N1 auto;reduction captions (4) off and no flags over digital counters
FUEL pointers (4) and lower digital counters	-	(4) 0, flags read F/E, top digits and settings indicators agree and no flags over lower digital counters
EGT pointers and digital counters	-	(4) Show sensible readings, no flags over digital counters and EGT instrument warning caption off
AREA pointers	-	(4) Show sensible readings, no flags and reheat selected captions off. If reheat caption (white) on, set REHEAT selectors to OFF and check reheat captions off.

Centre Console (Ref. Fig. 023)

Throttle levers	-	Check for freedom of movement
BAULK O/RIDE handle	-	Check aligned fore and aft and fully down
W/S WIPERS rotary selectors	-	(2) OFF
REHEAT selectors	-	(4) OFF
Throttle captions No.1 engine THROT caption	-	Press to test, check THROT (red), MWS (red) captions illuminate and audio (gong). Also No.1 engine THROTTLE MASTER switch caption (red) illuminates

NOTE: This tests the THROT caption and its connection to the master warning system and THROTTLE MASTER switch caption.

Repeat this test for No.2, 3 and 4 engine THROT captions.

VHF Comm	-	On
Frequency selectors	-	ATC (local control)
Air Data Computers		
ADC 1 and ADC 2 TEST rotary switches	-	(2) NORM
ADC 1 and ADC 2 switches	-	(2) ON

Lights panel (Ref. Fig. 023)

Lights selector	-	TEST, check all warnings on the centre dash panel are illuminated, release selector to HI or LO, check warnings return to system status
Total FUEL FLOW FT indicator index) Jet pipe total pressure) P7 indicator index)	-	(4) Set values of the day

POWER PLANT - SERVICING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

OBSERVE THE HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 29-00-00 AND 71-62-00 SERVICING.

OBSERVE THE SAFETY PRECAUTIONS WHEN ENTERING THE ENGINE AIR INTAKE (REF. PARA.2).

R IF CONTAMINATION OF THE ENGINE BY DANGEROUS SUBSTANCES
R IS SUSPECTED, HEALTH AND SAFETY PRECAUTIONS MUST BE
R OBSERVED.

CAUTION: DO NOT USE MOLYBDENUM DI-SULPHIDE LUBRICATING PRODUCTS EITHER ON THE ENGINE, THE ENGINE BAY AND THE TWIN SECONDARY NOZZLE, OR ON THE INTAKE AND ENGINE BAY DOORS EXCEPT WHERE SPECIFIED IN THE MAINTENANCE PRACTICES.

1. General

B A. This topic describes the general safety precautions to be observed when entering or leaving the engine air intakes and the twin secondary nozzle and jet pipes. It also details the procedure for opening and closing engine bay doors, and those for the drainage of oil from power plant components.

Each door assembly, front and rear, consists of a lower door and a side panel. For most servicing operations the lower door only may be opened, and secured with the strut carried on the door. For more extensive servicing, the lower door and side panel are opened together using the screwjacks. The front door overlaps the rear and must be opened first, and closed last.

The majority of the oil-lubricated components are located in the engine bay and access to them is gained by opening either one, or both, of the engine bay doors, as necessary; the exception is the ramp actuator which is situated in the ramp void and access is gained by entering the engine air intake.

B. Engine Air Intakes - Safe Working Conditions - BA Procedure (EN 6415).

(1) Prior to Working Inside the Air Intakes.

(a) Run the ramps to the fully down position (take normal precautions during this operation) - see 71-63-00.

(b) Install the anti-interference plate over flight deck air intake control panel (Plate Part No. E92.506800 BA Code HBTP0040).

(c) Trip and fit safety clip to ground hydraulic pump control circuit breaker, Panel 14-216 Map ref. A-16 - See 71-63-13.

(d) Install spill door selector locking pins. Pins for Bays 1 and 3 P/N E.92.5038.000, BA code HBTP0025, for Bays 2 and 4 P/N E92.5037.000, BA Code HBTP0024 - see 71-64-00.

(e) Install safety sleeve over ramp actuator screwjack. Remove electrical connectors from the ramp actuator and cap connectors using caps attached to safety sleeve. (Safety sleeve Part No. 1-71-1571-1BA, Code GWAS 1467).

Electrics and hydraulics may then be used on the aircraft whilst anybody is working inside the intakes. Removal of the electrical connectors and use of the safety sleeve will prevent actuator movement, even in the event of any unforeseen multiple defect or inadvertent selection on the flight deck switches.

(2) On Completion of Work in Air Intakes

(a) If previously removed, install anti-interference plate over flight deck air intake control panel.

(b) If previously removed, trip and fit safety clip to ground hydraulic pump control circuit breakers, Panel 14-216, Map ref. A-16. - see 71-63-13.

(c) Refit electrical connectors into ramp actuator.

(d) Remove safety sleeve from ramp actuator. See note below.

B (e) Remove spill door selector safety pins -
B see 71-64-00.

B (f) Remove safety clip from ground hydraulic pump
B control circuit breaker as required.

B (g) Remove anti-interference plate from flight deck.

B (h) Using ground hydraulic pumps, operate ramps and
B ensure that ramps respond to flight deck
B selection. Take normal precautions during this
B operation - see 71-63-00.

B NOTE: If safety sleeve will not come off easily,
B remove electrical connectors again from ramp
B actuator and examine actuator jack for damage.
B If the ramp actuator had attempted to run with
B the safety sleeve installed, damage to the
B actuator jack could have resulted.

2. Engine Air Intakes - Entrance

R WARNING 1: AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

R WARNING 2: AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, IF
R CONTAMINATION BY DANGEROUS SUBSTANCES IS
R SUSPECTED. IN THE EVENT OF CONTAMINATION, HEALTH
R AND SAFETY PRECAUTIONS MUST BE OBSERVED AND ENTRY
R MUST ONLY BE MADE BY PERSONNEL WEARING SUITABLE
R PROTECTIVE CLOTHING/APPARATUS.

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CAUTION: THE NEED FOR CLEANLINESS IN THE INTAKE CANNOT BE TOO STRONGLY EMPHASISED. EVERY PRECAUTION MUST BE TAKEN TO KEEP THE INTAKE FREE OF DEBRIS AND FOREIGN MATTER.

INTAKE BOTTOM LIP COVERS MUST BE FITTED TO PREVENT DAMAGE.

A. Equipment and Materials.

DESCRIPTION	PART NO.
Circuit breaker safety clips	
Locking pins, spill door selectors intake Nos. 2 and 4	E925037000
Locking pins, spill door selectors intakes Nos. 1 and 3	E925038000
Bottom lip cover	D926806000
Anti-interference plate, air intake management panel	E925068000
Servicing platform	-
Crawling board	-
Work stand	-
Engine face cover	PE12325

DESCRIPTION	PART NO.
Torque limiting screwdriver range: 25 to 30 lbf in (0.29 -0.34 mdaN)	-

R

B. Preparation

(1) Ensure that the intakes are clear of personnel and equipment.

(2) If necessary, position the ramps, or spill door as required for the servicing task (Ref. 71-63-00, 71-64-00)

(3) Depressurize the appropriate blue or green main hydraulic system and the yellow auxiliary hydraulic system (Ref.29-11-00, 29-12-00, 29-21-00, Servicing).

(4) Disconnect ground hydraulic rig.

(5) Switch off and disconnect electrical ground power (Ref. 24-41-00).

(6) Trip the appropriate circuit breakers, and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 1			
LH.IGNITION CONT.	3-213	1J1	E 1
RH.IGNITION CONT.	1-213	1J2	N 6
AICU 1A SUP.	2-213	1K2050	D14
AICU 1B SUP.	14-216	1K2051	A 5
INT1 MAIN HYD. SUP.	1-213	1K1950	D 9
INT1 STBY HYD. SUP.	15-216	1K1960	B 8
HYD.GRND CHECKOUT PUMP CONT.	14-216	M656	A16
HYD.GRND CHECKOUT			

SEL.VALVE CONT.	15-216	M626	F22
INTERFACE UNIT 1A/2B SUP	1-213	1K1976	H 9
INTERFACE UNIT 2A/1B SUP	15-215	2K1976	D 6

ENG 2

LH.IGNITION CONT.	3-213	2J1	E 2
RH.IGNITION CONT.	1-213	2J2	P 6
AICU 2A SUP.	13-215	2K2050	A15
AICU 2B SUP.	4-213	2K2051	B16
INT2 MAIN HYD. SUP.	15-215	2K1950	B18
INT2 STBY HYD. SUP.	5-213	2K1960	A 6
HYD GRND CHECKOUT PUMP CONT.	14-216	M656	A16
HYD GRND CHECKOUT SEL VALVE CONT.	15-216	M626	F22
INTERFACE UNIT 1A/2B SUP	1-213	1K1976	H 9
INTERFACE UNIT 2A/1B SUP	15-215	2K1976	D 6

ENG 3

LH.IGNITION CONT.	3-213	3J1	E 3
RH.IGNITION CONT.	1-213	3J2	Q 6
AICU 3A SUP.	4-213	3K2050	B17
AICU 3B SUP.	13-215	3K2051	B15
INT3 MAIN HYD. SUP.	5-213	3K1950	A 7
INT3 STBY HYD. SUP.	15-215	3K1960	C18
HYD GRND CHECKOUT PUMP CONT.	14-216	M656	A16
HYD GRND CHECKOUT SEL.VALVE CONT.	15-216	M626	F22
INTERFACE UNIT 3A/4B SUP	5-213	3K1976	D 6
INTERFACE UNIT 4A/3B SUP	15-216	4K1976	D 8

ENG 4

LH IGNITION CONT.	3-213	4J1	E 4

RH IGNITION CONT.	1-213	4J2	R 6
AICU 4A SUP.	14-216	4K2050	B 5
AICU 4B SUP	2-213	4K2051	B14
INT4 MAIN HYD. SUP.	15-216	4K1950	A 8
INT4 STBY HYD. SUP	1-213	4K1960	E 9
HYD GRND.CHECKOUT PUMP CONT.	14-216	M656	A16
HYD GRND CHECKOUT SEL VALVE CONT.	15-216	M626	F22
INTERFACE UNIT 3A/4B SUP	5-213	3K1976	D 6
INTERFACE UNIT 4A/3B SUP	15-216	4K1976	D 8

NOTE: The Air start, ignition control and intake control circuit breakers on the adjoining intake must also be isolated.

---

(7) At the 3CM station, set the ramp/spill master switches on the intake control panel to "MAN".

(8) Fit the anti-interference plate over the master and inching switches and lock it in position. Retain the key.

(9) Place a warning placard at the 3CM station to indicate that work is being carried out in the intakes.

(10) Remove the appropriate filter bay access panel (Ref. Fig. 301). Fit the locking pins to the spill door selector valves as illustrated.

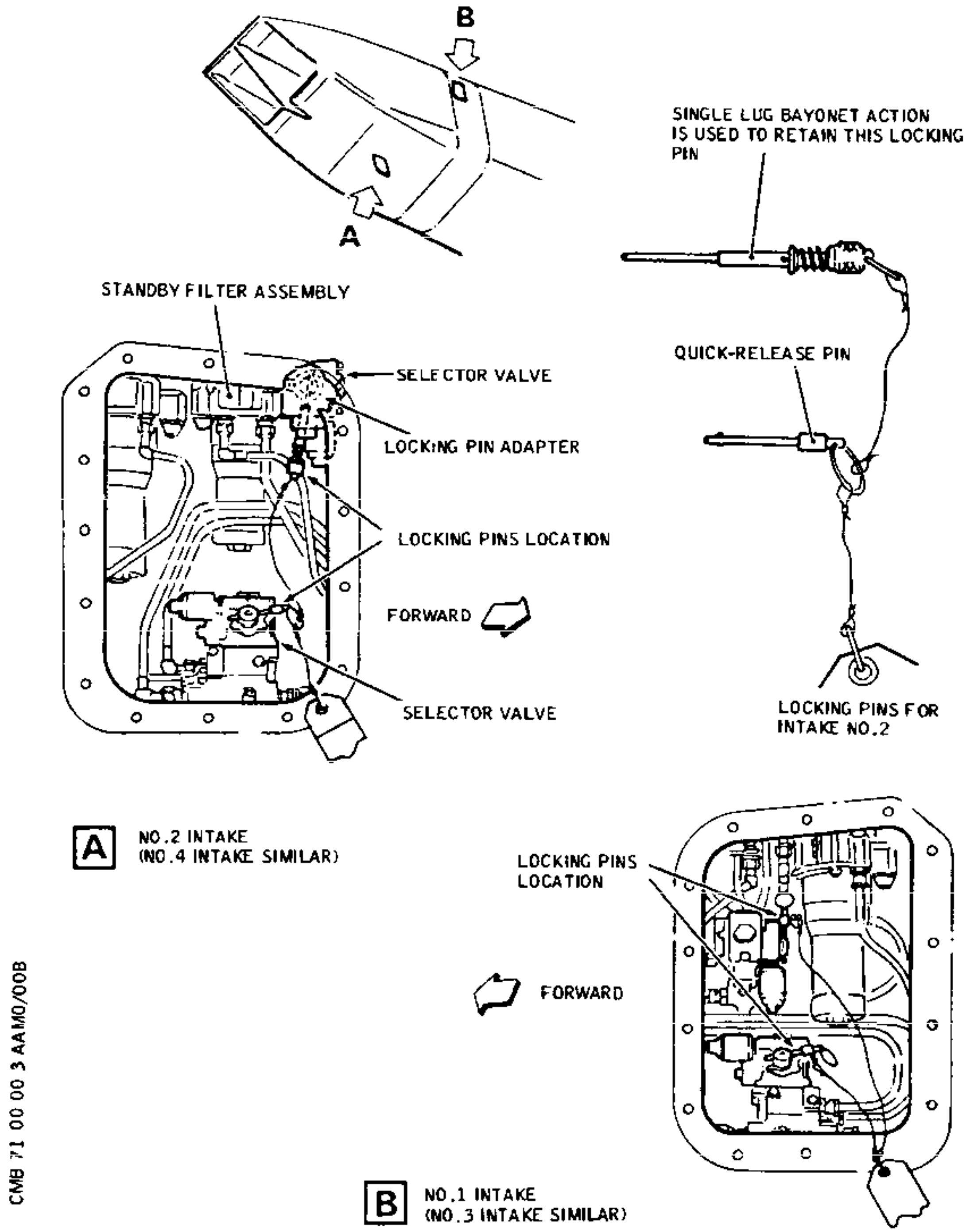
(11) Before entering the air intake:

WARNING: LOOSE ARTICLES IN THE POCKETS OR ABOUT THE PERSON CAN RESULT IN EXTENSIVE DAMAGE TO AN ENGINE AND ARE A POTENTIAL HAZARD TO THE SAFETY OF THE AIRCRAFT.

(a) Empty the pockets of all loose articles.

(b) Remove any loose articles from about the person such as rings, tie pins and brooches.

(c) Wear a clean overall or garment with no loose



Spill Door - Locking Pins
Figure 301

buttons.

(d) Wear canvass or rubber soled slip-on shoes.

(12) Declare all tools and equipment to be taken into the intake.

(13) Fit the air intake protective equipment (Ref. Fig. 302):

(a) Secure the bottom lip cover to the leading edge.

(b) Position a work stand in front of the air intake.

(c) Place a crawling board in the diffuser.

(d) Fit the engine face cover to the engine intake.

(14) Carry out any other safety precautions which are specific to the accomplishment of the particular servicing.

3. Engine Air Intakes - Exit

CAUTION: THE FINAL CHECK FOR CLEANLINESS OF THE INTAKE MUST INCLUDE A METICULOUS EXAMINATION FOR LOOSE OBJECTS OR DEBRIS. IN ADDITION THE INTAKE SHOULD BE VACUUM CLEANED.

(1) Ensure that the intake is clean and remove the safety equipment (Ref. Fig. 302).

(2) Check that all tools and equipment, declared before entering the intakes are removed.

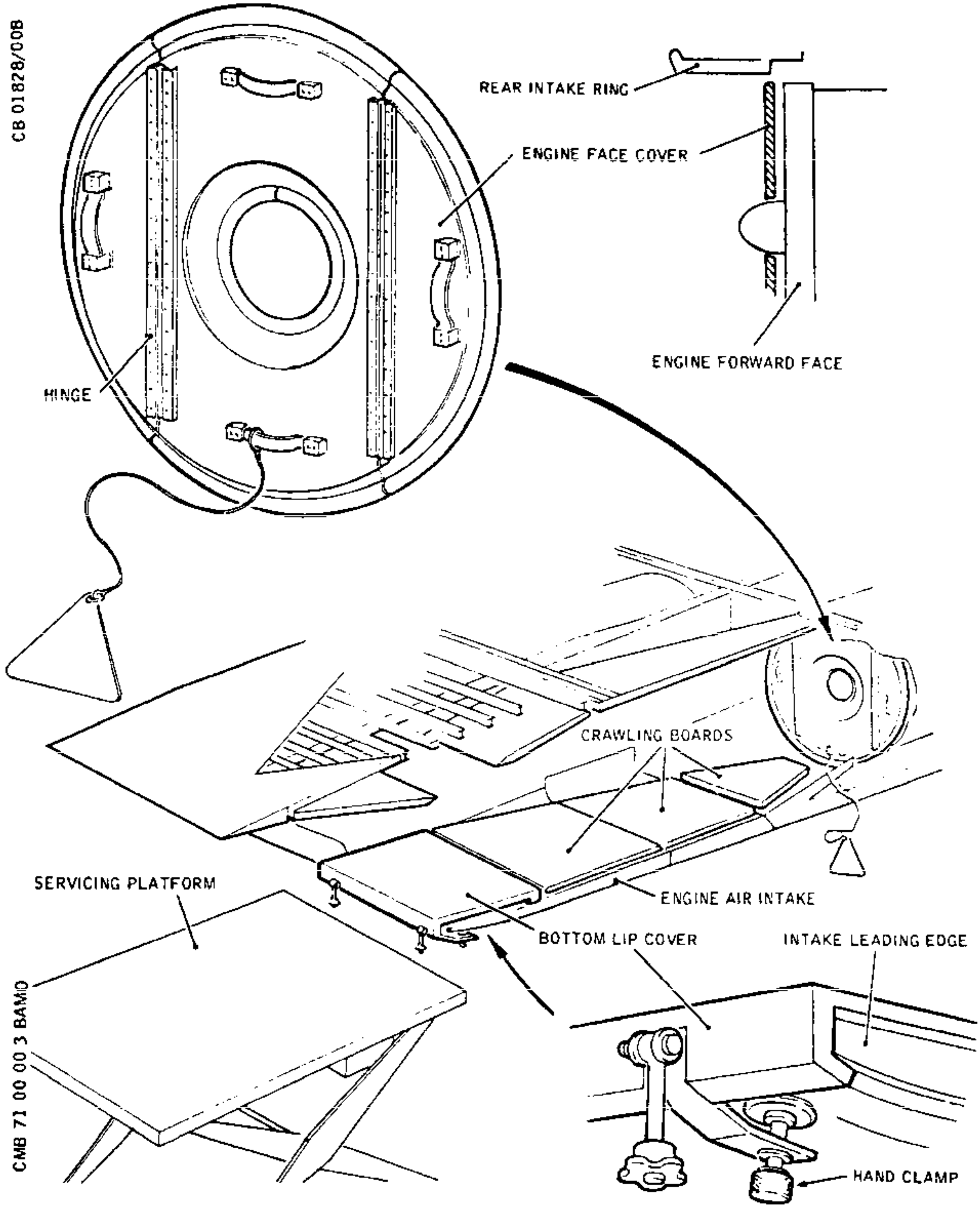
(3) Remove the safety clips and set the previously tripped circuit breakers.

(4) Remove the warning placard from the 3CM station.

(5) Check that the reinstatement of hydraulic power will not adversely affect the aircraft or its systems, then pressurize the hydraulic systems that were previosuly depressurized (Ref. 29-11-00, 29-12-00,, 29-21-00, Servicing).

(6) Carry out any test required by the particular servicing/ maintenance procedure.

NOTE: The tests will detail the required configuration of



Protective Equipment - Air Intake
Figure 302

the intake systems, such as locking pins fitted or removed, anti-interference plate fitted or removed, use of test equipment, etc.

(7) Unlock and remove the anti-interference plate.

(8) Reset the ramp/spill master switches on the intake control panel to "AUTO".

(9) Remove the locking pins from the hydraulic selector valves (Ref. Fig. 301).

(10) Check that the seals on the filter bay access panel are undamaged and refit the panel to the nacelle. Using a torque limiting screwdriver, torque-tighten the panel fasteners to between 25 and 30 lbf in (0.29 and 0.34 mdaN).

4. Engine Bay Lower Doors - Opening to Servicing Position

WARNING: THE DOORS HAVE A LARGE SURFACE AREA AND CAUTION SHOULD BE EXERCISED WHEN OPENING THEM. DO NOT OPEN THE DOORS IF THE WIND VELOCITY EXCEEDS 65 KNOTS.

A. Equipment and Materials

CAUTION: THE FORWARD DOOR MUST BE OPENED FIRST AND, DURING CLOSING, THE REAR DOOR MUST BE CLOSED FIRST OTHERWISE DAMAGE TO THE DOORS WILL OCCUR.

DESCRIPTION	PART NO.
Circuit breaker safety clips	D925203000
Latch key	D925443000

B. Prepare to Open Lower Door

(1) Trip the circuit breakers, on the relevant power plant, and secure them in the tripped position with safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 1			
LH.IGNITION CONT.	3-213	1J1	E 1
RH.IGNITION CONT.	1-213	1J2	N 6
SEC.AIR DOOR MTR. SUP.	2-213	1K247	C10
BAY COOLING FLAP CONT. AND IND.	3-213	1K231	F 1
REHEAT CONT.	15-216	1K1542	E 9
REHEAT AMP.SUP.	14-215	1K1541	C13
ENG 2			
LH.IGNITION CONT.	3-213	2J1	E 2

RH.IGNITION CONT.	1-213	2J2	P 6
SEC.AIR DOOR MTR. SUP.	2-213	2K247	F10
BAY COOLING FLAP CONT. AND IND.	1-213	2K231	D 3
REHEAT CONT.	15-215	2K1542	D15
REHEAT AMP.SUP.	13-215	2K1541	B14
ENG 3			
LH.IGNITION CONT.	3-213	3J1	E 3
RH.IGNITION CONT.	1-213	3J2	Q 6
SEC.AIR DOOR MTR. SUP.	4-213	3K247	A19
BAY COOLING FLAP CONT. AND IND.	1-213	3K231	D 4
REHEAT CONT.	15-215	3K1542	D16
REHEAT AMP SUP.	13-216	3K1541	B 5
ENG 4			
LH.IGNITION CONT.	3-213	4J1	E 4
RH IGNITION CONT.	1-213	4J2	R 6
SEC.AIR DOOR MTR. SUP.	4-213	4K247	F19
BAY COOLING FLAP CONT. AND IND.	3-213	4K231	F 2
REHEAT CONT.	15-216	4K1542	E10
REHEAT AMP SUP.	14-216	4K1541	D 7

NOTE: 1) Isolate air start and ignition control circuit breakers on adjoining engines.

2) Isolation of reheat control is unnecessary if opening the forward door only.

---

(2) Place a warning notice at the 3CM position to indicate that work is in progress on a particular engine.

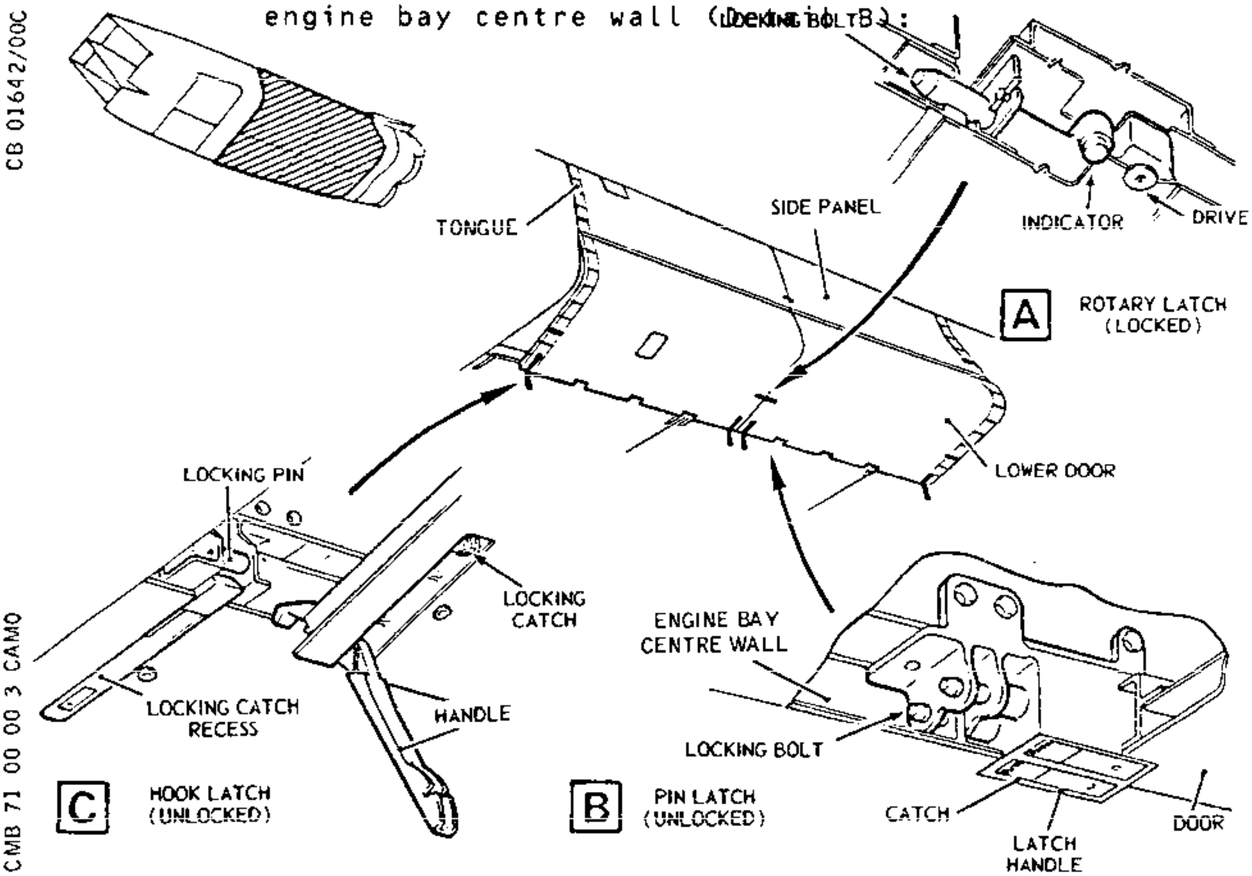
(3) Ensure that the area in the vicinity of the power

plant is clear of personnel and equipment.

C. Open Doors (Ref. Fig. 303)

(1) On the forward lower door withdraw each rotary latch locking bolt (Detail A) from the intake and rear door by engaging the key with the latch drive and turning it counter-clockwise as far as possible. Check that the red indicator protrudes from the door surface.

(2) Disengage each latch pin from its fitting on the engine bay centre wall (Detail B):



Engine Bay Doors
Figure 303

CAUTION: DEPRESS AND HOLD THE CATCH ENGRAVED "PUSH" WHEN OPENING THE LATCH; FAILURE TO DO SO MAY RESULT IN DAMAGE TO THE LATCH FITTING.

(a) Insert the handle of the key into the recess of the latch.

(b) Depress the catch marked PUSH and continue to hold the catch depressed.

(c) Rotate the handle to withdraw the locking bolt.

(3) Manually support the lower door and release each hook latch (Detail C):

(a) Insert the key into the locking catch recess, and rotate the key outboard to free the latch handle.

(b) Allow the handle to rotate until the door is supported by the hook latch.

(c) Support the door, using the handle as a lever, and disengage the hook latches from their locking pins; allow the door to hinge down.

(4) Secure the lower door to the intake structure using the strut:

(a) Remove the quick-release pin securing one end of the strut to the door.

(b) Remove the locking pin and the knurled bolt securing the other end of the strut to the door; remove the strut.

(c) Secure the door strut to the intake structure with the knurled bolt.

(d) Hold the door firmly and secure the opposite end of the door strut to the lug on the door with the quick-release pin.

(5) Open and secure the rear door in a manner similar to that described for the front door, but secure the rear door strut to the structure of the twin secondary nozzle.

D. Prepare to Close Lower Doors

(1) Inspect the engine and engine bay for leakage of fuel, oil and hydraulic fluid, and for security of parts.

(2) Hold the rear lower door firmly and remove the quick-release pin securing the door strut to the door; allow the door to hinge down.

(3) Secure the door strut to the inner surface of the door:

(a) Remove the bolt securing the door strut to the twin secondary nozzle; remove the strut.

(b) Engage the strut with the door stowage fittings and secure it in position with a quick-release pin at one end, and the knurled bolt at the other end; lock the bolt with the locking pin provided.

E. Close Lower Doors (Ref. Fig. 303)

(1) Hinge the lower door to the closed position using the hook latch handle as a lever; and engage the hook latches (Detail C) with the locking pins in the engine bay centre wall. Push each hook latch handle into the closed position ensuring that the handle is flush with the outer skin of the door.

(2) Using the latch key push the handle of the pin latches on the engine bay centre wall (Detail B) to engage the locking bolts with the door brackets, ensuring that the handle and locking catch of each latch pin is flush with the outer skin of the door.

(3) Secure the lower door to the nozzle structure by operating the rotary latch using the key to operate the latch drive, turning it clockwise as far as possible. Check that the red indicator is flush with the door surface.

(4) Remove the strut and close and lock the front lower door in a manner similar to that described for the rear door.

F. Conclusion

(1) Remove the safety clips from the circuit breakers and reset the circuit breakers.

(2) Remove the warning notice from the 3CM position.

5. <u>Engine Bay Door Lower and Side Panel - Opening</u>

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clip	D915203000
Latch key	D925443000
Screwjack/stay nacelle forward door	E925013000
Screwjack/stay nacelle rear door	E925013001

B. Prepare to Open Doors (Ref. Fig. 304)

(1) Open the forward lower door to the servicing position (Ref. para.4) but do not attach the door strut; allow the door to hinge down.

C. Open the Doors (Ref. Fig. 304)

(1) Assemble the screwjack to the intake structure and to the forward lower door.

(a) Secure the handle to the screwjack with a quick-release pin.

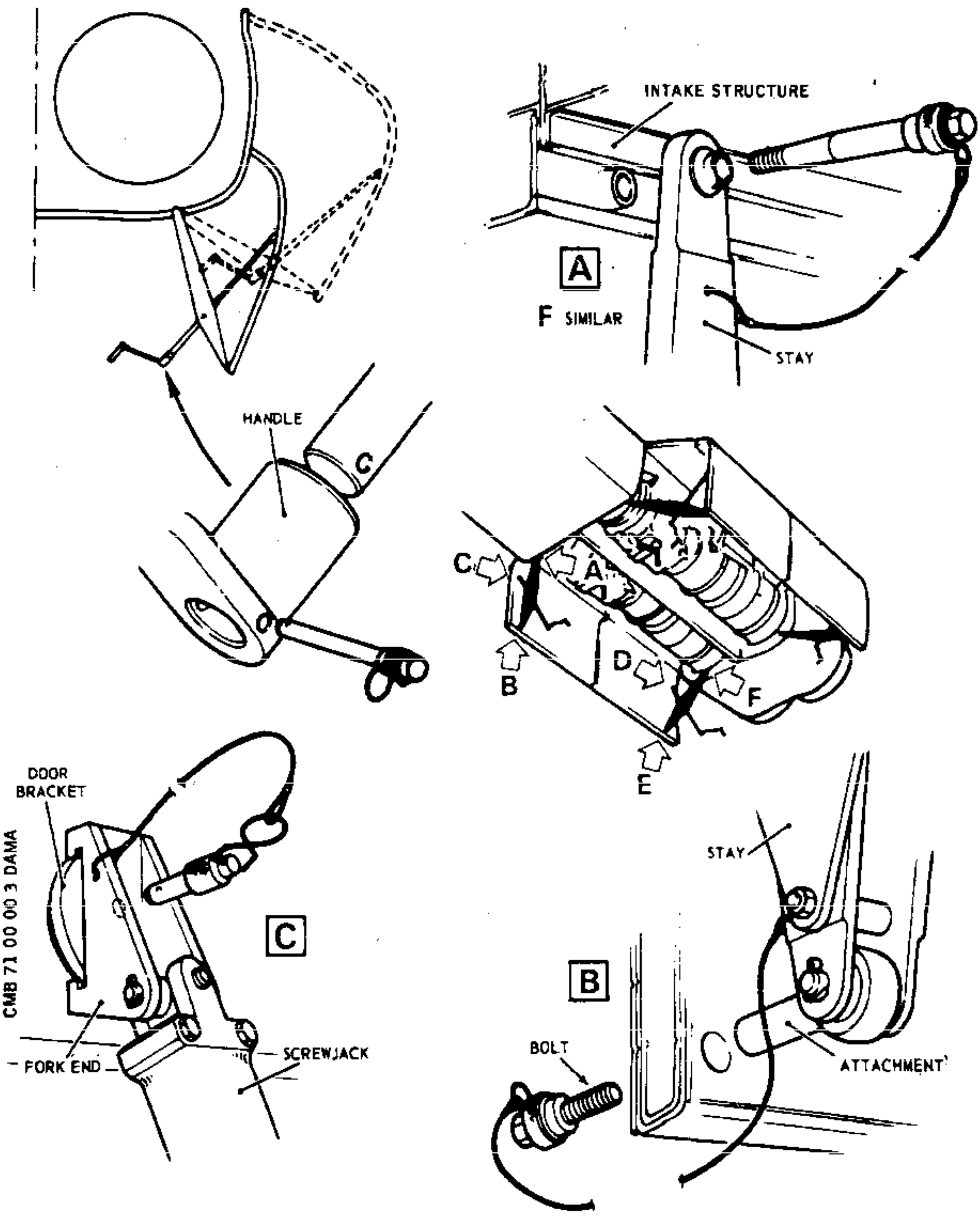
(b) Secure the door stay to the intake structure with a bolt (Detail A), and to the door with the attachment assembly and bolt (Detail B).

(c) Engage the screwjack fork end with the door bracket and secure it with a quick-release pin (Detail C).

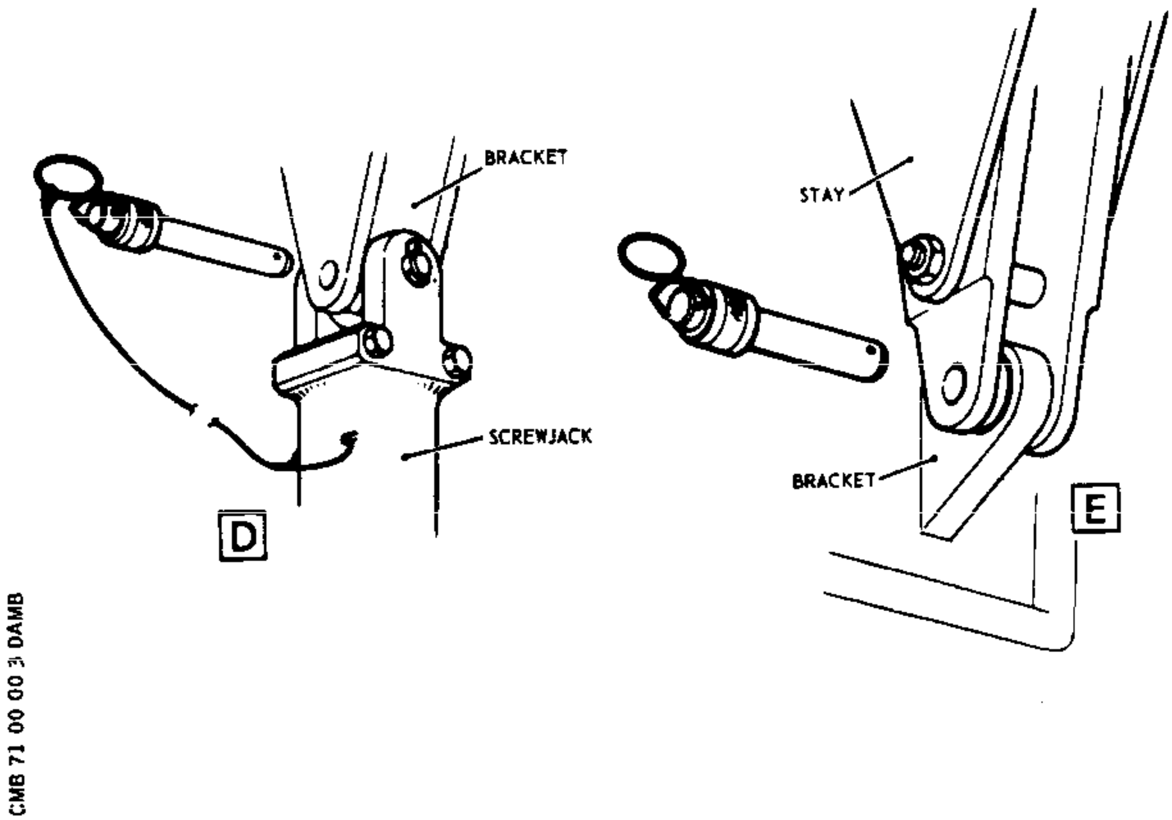
(2) Release the rotary latches (Ref. Fig. 303) securing the forward door side panel to the intake and rear side panel.

(3) Operate the screwjack handle to open the lower door and side panel until the screwjack reaches the end of its travel; remove the handle from the screw-jack.

(4) Open and support the rear lower door and side panel in a manner similar to that detailed for the forward doors, except that the screwjack locates on the rear door (Ref. Details D and E).



Engine Bay Door Support Equipment
Figure 304



Engine Bay Door Support Equipment
Figure 304

D. Prepare to Close Doors

(1) Inspect the engine and engine bay for leakage of fuel, oil and hydraulic fluid, and for security of parts.

E. Close Engine Bay Doors (Ref. Fig. 304)

(1) On the rear door, fit the handle to the screwjack with a quick-release pin.

(2) Operate the handle to lower the rear door and side panel until the side panel abuts the door surround.

(3) Secure the side panel to the nozzle by operating the rotary latch using the key to operate the latch drive, and turning it clockwise as far as possible. Check that the red indicator is flush with the door surface.

(4) Continue to operate the handle until the weight of

the door is removed from the screwjack.

(5) Remove the screwjack from the rear door and from the nozzle.

(6) Close and lock the lower rear door (Ref. para.4).

(7) Close and lock the forward engine bay lower door and side panel in a manner similar to that described for the rear door.

F. Conclusion (Ref. Fig. 305)

(1) Remove the safety clips from the circuit breakers and reset the circuit breakers.

(2) Remove the warning notice from the 3CM position.

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6. Twin Secondary Nozzle and Jet Pipe - Entry

R WARNING 1: BEFORE ENTERING A NOZZLE/JET PIPE ENSURE THAT ALL ELECTRICAL SERVICES TO THE PARTICULAR ENGINE AND EXHAUST SYSTEM ARE ISOLATED AND THE AIR SUPPLY RIGS TO THE AIR START AND GROUND CONNECTIONS HAVE BEEN REMOVED.

R WARNING 2: A NOZZLE/JET PIPE MUST NOT BE ENTERED, OR WORKED
R ON, IF CONTAMINATION BY DANGEROUS SUBSTANCES IS
R SUSPECTED. IN THE EVENT OF CONTAMINATION, ENTRY
R MUST ONLY BE MADE BY PERSONNEL WEARING SUITABLE
R PROTECTIVE CLOTHING/APPARATUS.

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Protection mats for thrust reverse bucket and jet pipe	-
Servicing steps	-

B. Preparation

(1) Remove the air supply rigs:

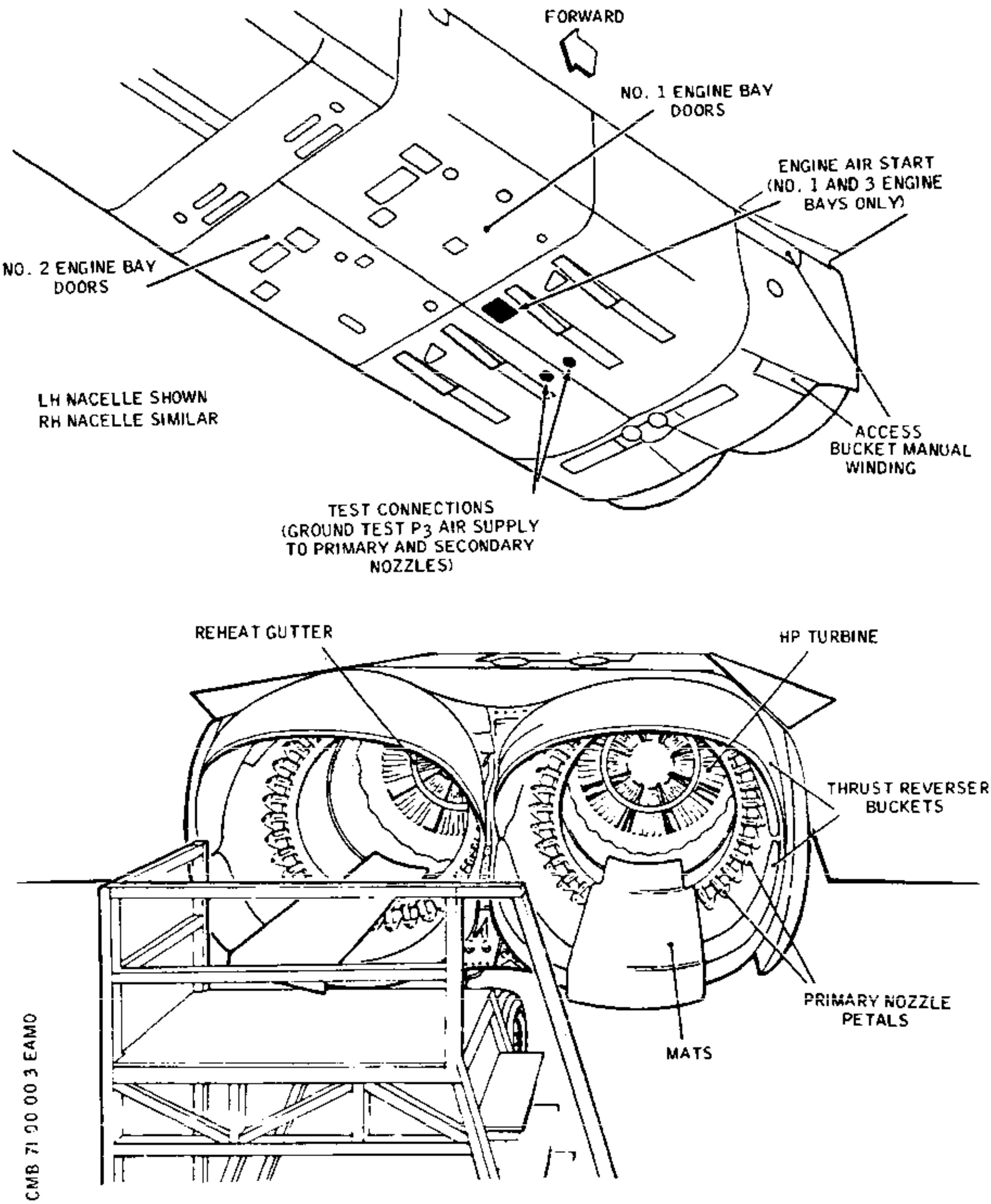
(a) Disconnect and remove the air supply rig to the air start connection in No.1 or No.3 rear engine bay door as appropriate.

(b) Remove if fitted, the air supply rig to both ground connections, on the rear panel of the engine bays centre wall.

NOTE: These are the connections for static testing of the exhaust system.

WARNING: DO NOT ENTER A NOZZLE JET PIPE WITH AN AIR SUPPLY CONNECTED TO EITHER OF THE GROUND CONNECTIONS IN A NACELLE.

(2) Trip the appropriate circuit breakers and fit safety clips.



Twin Secondary Nozzle and Jet Pipe - Entry
Figure 305

R

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 1			
L.H. IGNITION CONT.	3-213	1J1	E1
R.H. IGNITION CONT.	1-213	1J2	N6
REHEAT AMP.SUP.	14-215	1K1541	C13
REHEAT CONT.	15-216	1K1542	E9
BUCKET CONT.UNIT SUP	14-215	1K1132	E12
ENG 2			
L.H. IGNITION CONT.	3-213	2J1	E2
R.H. IGNITION CONT.	1-213	2J2	P6
REHEAT AMP.SUP	13-215	2K1541	B14
REHEAT CONT.	15-215	2K1542	D15
BUCKET CONT.UNIT SUP	13-215	2K1132	G14
ENG 3			
L.H. IGNITION CONT.	3-213	3J1	E3
R.H. IGNITION CONT.	1-213	3J2	Q6
REHEAT AMP.SUP	13-216	3K1541	B4
REHEAT CONT.	13-215	3K1542	D16
BUCKET CONT.UNIT SUP	13-216	3K1132	C6
ENG 4			
L.H. IGNITION CONT.	3-213	4J1	E4
R.H. IGNITION CONT.	1-213	4J2	E6
REHEAT AMP.SUP.	14-216	4K1541	D7
REHEAT CONT.	15-216	4K1542	E10
BUCKET CONT.UNIT SUP	14-216	4K1132	C6

(3) Place warning placards at the 3CM station and the air start and ground connections to indicate that work is being carried out on the twin secondary nozzle or jet pipe.

(4) Before entering the nozzle/jet pipe similar precautions, to those about loose articles and the recommended type of clothing for intake entry, should be observed (Ref. para.2).

C. Entry

(1) Place mats over the buckets and in the jet pipe.

NOTE: No specific temperature is quoted as a maximum for entering the jet pipe. If the aircraft is into wind the jet pipe will cool more rapidly with the intake blanks fitted.

(2) Ensure that manual winding gear is not in use on the thrust reverse bucket screwjacks.

(3) Carry out any other safety precautions which are specific to the accomplishment of the particular servicing task.

(4) Station an observer outside the twin secondary nozzle. Enter the nozzle with a retrieval rope secured to the ankle.

CAUTION: INSIDE THE JET PIPE TAKE CARE NOT TO DAMAGE PROBES, SENSORS OR OTHER FITTINGS. IN PARTICULAR DO NOT USE THESE ITEMS AS HANDHOLDS.

D. Exit

(1) Ensure that the jet pipe/nozzle is clean and remove the protection mats.

(2) Check that all tools and equipment used in the jet pipe/nozzle are removed.

(3) Remove the safety clips and reset the circuit breakers.

(4) Remove the warning placard from the 3CM station.

7. Ramp Actuator - Oil Draining (Ref. Fig.306).

A. Materials and Equipment

DESCRIPTION	PART NO.
Container, 1 pint (0.71) capacity	-
Torque spanner, range 0-50 lbf in (0.6 mdaN)	-
R Corrosion resistant steel wire, R 0.031 in (0.8 mm) dia.	DTD 189
Oil, DERD 2497 (Ref. 20-30-00, No.21)	-

B. Prepare to Drain

CAUTION: TAKE CARE NOT TO DAMAGE THE RAMPS, PARTICULARLY THE REAR RAMP LEADING EDGE, WHICH INCORPORATES AN ANTI-ICING ELEMENT.
AFTER DRAINING, THE MAX OIL LEVEL PLUG IS LEFT UNLOCKED IN PREPARATION FOR OIL REPLENISHING (REF.12-13-71).

(1) Gain entry into the engine air intake (Ref. para.2).

C. Drain Actuator (Detail A)

(1) Remove the wire securing the stack pipe securing bolts and the MIN OIL LEVEL and the MAX OIL LEVEL plugs; remove the MAX OIL LEVEL plug and sealing washers.

(2) Position a suitable container below the MIN OIL LEVEL stack pipe. Remove the two bolts securing the stack pipe and remove pipe. Allow oil to drain from the open port for at least five minutes. Discard the drained oil.

(3) Ensure that the MAX OIL LEVEL stack pipe plug is clean; temporarily refit the plug and sealing washer to the actuator.

(4) Remove and discard the O-ring seal from the MIN OIL LEVEL stack pipe. Visually inspect the stack pipe for cleanliness and damage, and ensure that the bore of the pipe is clear. Position a new O-ring seal on the pipe, and lubricate the screw threads with oil DERD 2497.

(5) Install the stack pipe and secure it to the actuator casing with two bolts. Torque load each bolt to between 35 and 44 lbf in (0.4 and 0.5 mdaN). Lock each bolt to the adjoining bolt securing the MAX OIL LEVEL stack pipe with wire.

(6) Remove oil spillage from the actuator casing and from the floor of the intake diffuser, and remove all tools and equipment from the top surface of the ramps and the intake.

8. Air Starter - Oil Drainage (Ref. Fig. 306)

A. Equipment and Materials

DESCRIPTION	PART NO.
Container, 1 pint (0.71) capacity	-
Oil, DERD 2497 (Ref. 20-30-00, No.21)	-
Torque spanner, range 0-280 lbf in (0-3 mdaN)	-

B. Prepare to Drain

(1) Open the appropriate engine bay forward lower door (Ref. para.4)

C. Drain Starter (Detail F)

CAUTION: AFTER DRAINING, THE LEVEL PLUG IS TEMPORARILY FITTED IN PREPARATION FOR OIL REPLENISHING (REF. 12-13-80).

NOTE: A magnetic plug is located in the drain plug.

(1) Position a suitable container below the drain plug.

(2) Remove the level plug and the drain plug. Allow oil to drain into the container for at least five minutes. Discard the drained oil.

(3) Remove and discard the sealing washer from the drain plug. Visually inspect the magnetic plug and the drain plug for cleanliness and damage, refit a

new sealing washer to the drain plug, and lubricate the screw threads with oil DERD 2497. (Ref. 20-30-00, No.21).

(4) Refit the drain plug to the starter; torque load the plug to between 255 and 260 lbf in (2.9 and 2.94 mdaN).

(5) Ensure that the level plug is clean; temporarily refit the washer and plug to the starter.

9. Engine Oil System - Oil Drainage (Ref. Fig. 306)

NOTE: If a gearbox only is required to be drained of oil, the quantity drained from it is to be recorded. This will permit the correct quantity of oil to be added to the oil tank during oil replenishing (Ref. 12-13-79).

A. Equipment and Materials

DESCRIPTION	PART NO.
Drain tube, fill/drain coupling	PE.26472
Drain tube, overflow drain coupling	PE.29482
Drain tube, RH/LH gearbox	PE.29023
Container, 55 pints (251) capacity	-
Oil, DERD 2497 (Ref. 20-30-00, No.21	-
Grease, Aeroshell 8 (Ref.20-30-00, No. 70)	-
R R Corrosion resistant steel wire 0.031 in (0.8 mm) dia.	DTD 189
Torque spanners, range 0-300 lbf in (0-5.1 mdaN)	-

B. Prepare to Drain

(1) Open the appropriate engine bay lower forward

door (Ref. para.4).

C. Drain Oil Tank (Detail C)

(1) Position a suitable container below the oil fill/ drain coupling.

(2) Connect a drain tube to drain most of the tank oil content:

(a) Turn the knurled pressure cap to unlock it; remove the cap.

(b) Position the drain tube end in the container, and engage the drain tube adapter with the fill/ drain coupling.

NOTE: Engaging the adapter with the coupling opens a valve, allowing oil to drain from the tank.

(c) When oil ceases to drain from the tank, disconnect the drain tube adapter from the coupling, and refit the pressure cap. Ensure that the knurled locking ring is locked.

(3) Drain residual oil from the tank:

WARNING: AVOID CONTACT WITH HOT OIL SPILLAGE WHEN REMOVING THE SCREWED PLUG FROM THE TANK, ALSO WHEN REMOVING THE PRESSURE CAP FROM THE OVERFLOW DRAIN COUPLING, OTHERWISE SEVERE BURNS CAN BE RECEIVED.

(a) Remove the screwed plug, and allow remaining oil to drain into the container.

(b) Visually inspect the screwed plug for damage and cleanliness.

(c) Remove the screwed plug from the overflow drain, and allow oil trapped in the overflow tube to drain.

(d) Ensure that the sealing washer on the screwed plugs are serviceable, and lubricate the tank plug screw threads with Aeroshell grease 8, and the overflow screwed plug with oil SERD 2947.

(e) Fit the tank plug and torque load it to between 230 and 250 lbf in (2.6 and 2.8 mdaN). Lock the

plug to the oil tank contents transmitter and overfull warning switch retaining bolt with wire.

(f) Fit the screwed plug to the overflow drain and torque load it to 100 lbf in. (1.2 mdaN). Lock the plug to the adjacent bracket on the engine with wire.

D. Drain Right-hand Gearbox (Detail D)

(1) Reposition the container below the scavenge filter.

(2) Remove the screwed magnetic plug.

(3) Carry out the magnetic plug inspection procedure detailed in 72-01-02.

(4) Position the drain tube end in the container, remove the cap from the tube adapter, then screw the adapter into position.

<u>CAUTION:</u> USE ONLY THE APPROVED DRAIN TUBE.

<u>NOTE:</u> Engaging the adapter with the gearbox opens a valve allowing oil to drain from the gearbox.

(5) When oil ceases to drain from the drain tube, remove the tube. Record the quantity of oil drained.

(6) Install the screwed magnetic plug:

R <u>CAUTION:</u> IT IS OF THE UTMOST IMPORTANCE TO ENSURE THAT ALL MAGNETIC PLUG ASSEMBLIES ARE FULLY TORQUE-TIGHTENED ON ASSEMBLY. ALSO, WHEN FITTING ASSEMBLIES MODIFIED TO SB.OL.593-72-9036-419 STANDARD A SERVICEABLE 'O' SEAL MUST BE FITTED. FAILURE TO DO THIS CAN RESULT IN OIL LEAKAGE IN FLIGHT WHICH MAY NOT BE APPARENT DURING GROUND CHECKS/ RUNNING.

R (a) Lubricate the plug screw threads with oil DERD 2497; refit the plug.

R (b) Torque-tighten the plug to 30 lbf ft. (40 N.m).

R (c) Lock the plug to the retaining ring with wire.

E. Drain Left-hand Gearbox (Detail B)

(1) Reposition the container below the main oil pump.

(2) Remove the screwed magnetic plug.

(3) Carry out the magnetic plug inspection/check procedure detailed in 72-01-02.

(4) Position the drain tube end in the container, and screw the drain tube adatper into position.

CAUTION: USE ONLY THE APPROVED DRAIN TUBE.

NOTE: Engaging the adapter with the coupling opens a valve allowing oil to drain from the gearbox.

(5) When oil ceases to drain from the drain tube, remove the tube. Record the quantity of oil drained.

(6) Install the screwed magnetic plug:

CAUTION: IT IS OF THE UTMOST IMPORTANCE TO ENSURE THAT ALL MAGNETIC PLUG ASSEMBLIES ARE FULLY TORQUE-TIGHTENED ON ASSEMBLY. ALSO, WHEN FITTING ASSEMBLIES MODIFIED TO SB.OL.593-72-9036-419 STANDARD A SERVICEABLE 'O' SEAL MUST BE FITTED. FAILURE TO DO THIS CAN RESULT IN OIL LEAKAGE IN FLIGHT WHICH MAY NOT BE APPARENT DURING GROUND CHECKS/ RUNNING.

(a) Lubricate the plug screw threads with oil DERD 2497; refit the plug. Torque-tighten the plug to 30 lbf ft. (40 N.m).

(b) Lock the plug to the coupling ring and to the gearbox casing with wire.

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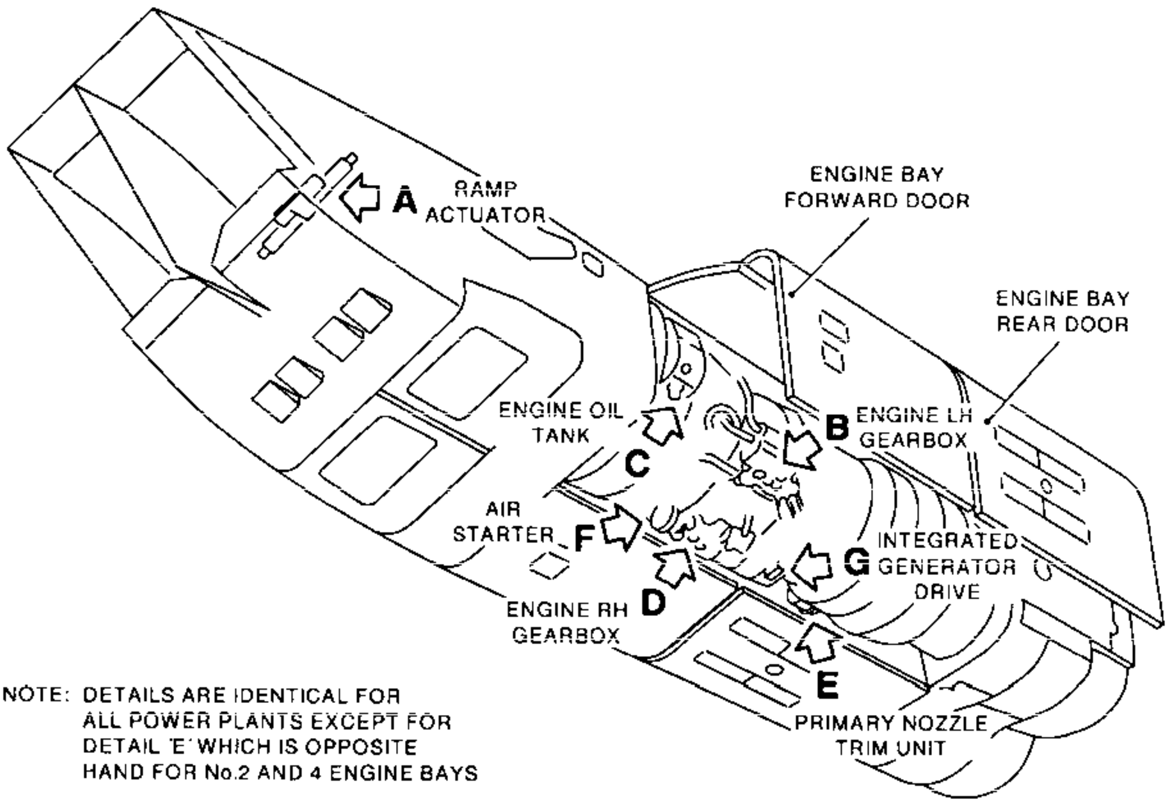
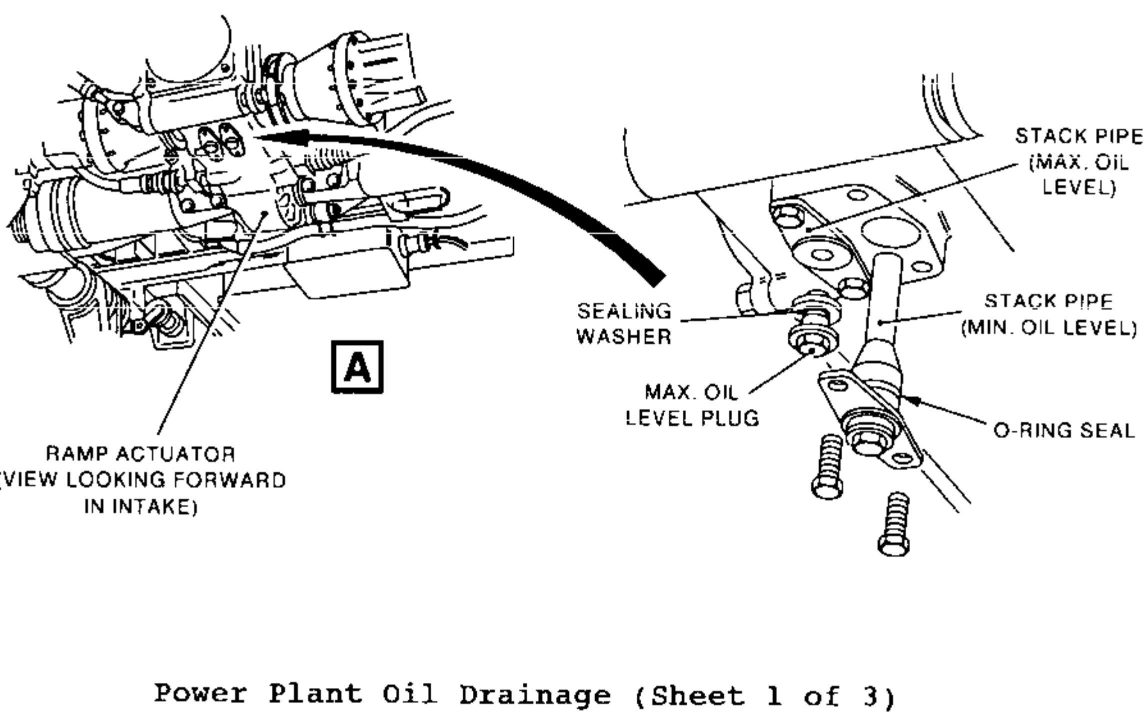


NOTE: DETAILS ARE IDENTICAL FOR ALL POWER PLANTS EXCEPT FOR DETAIL 'E' WHICH IS OPPOSITE HAND FOR No.2 AND 4 ENGINE BAYS



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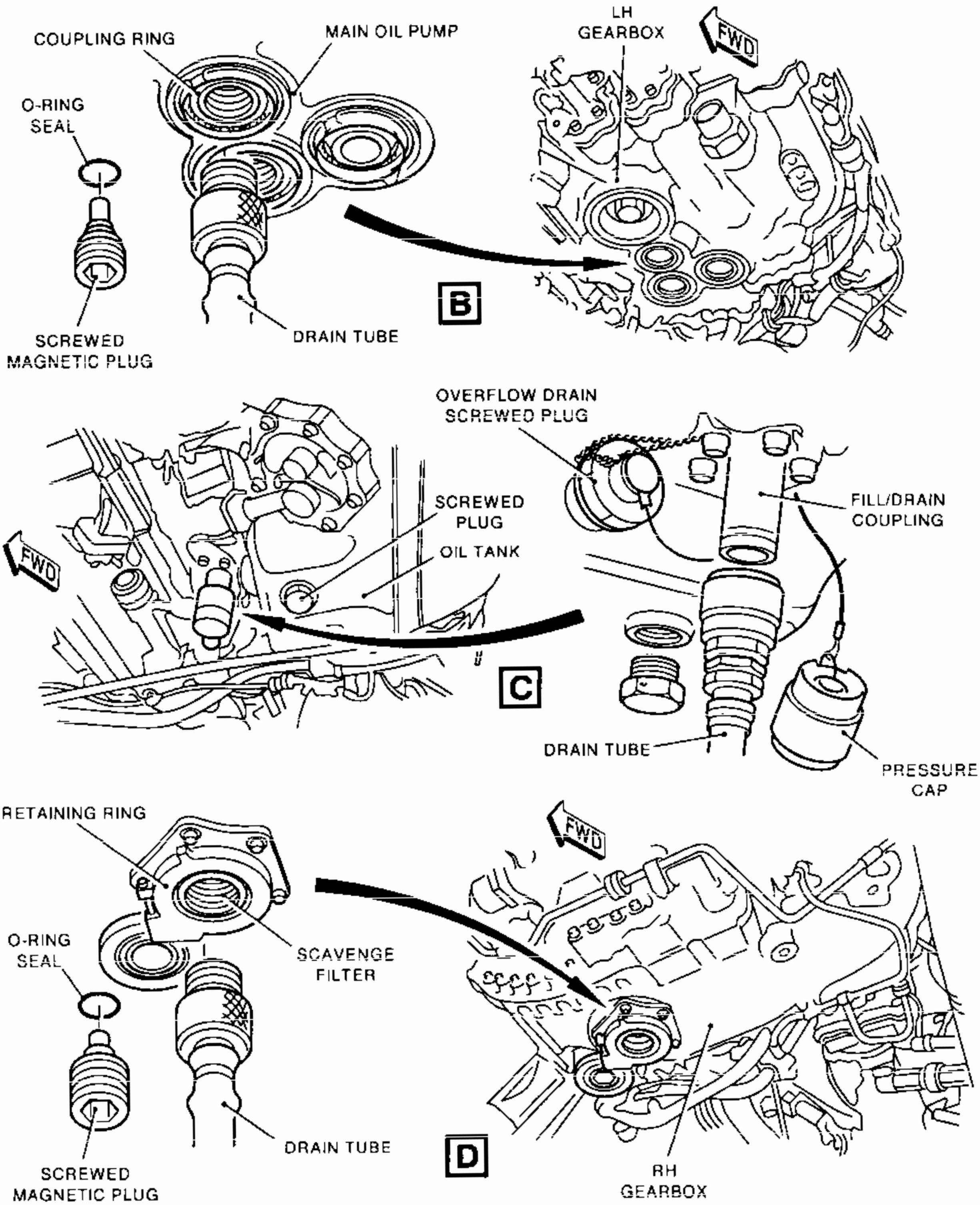
Power Plant Oil Drainage (Sheet 1 of 3)
Figure 306



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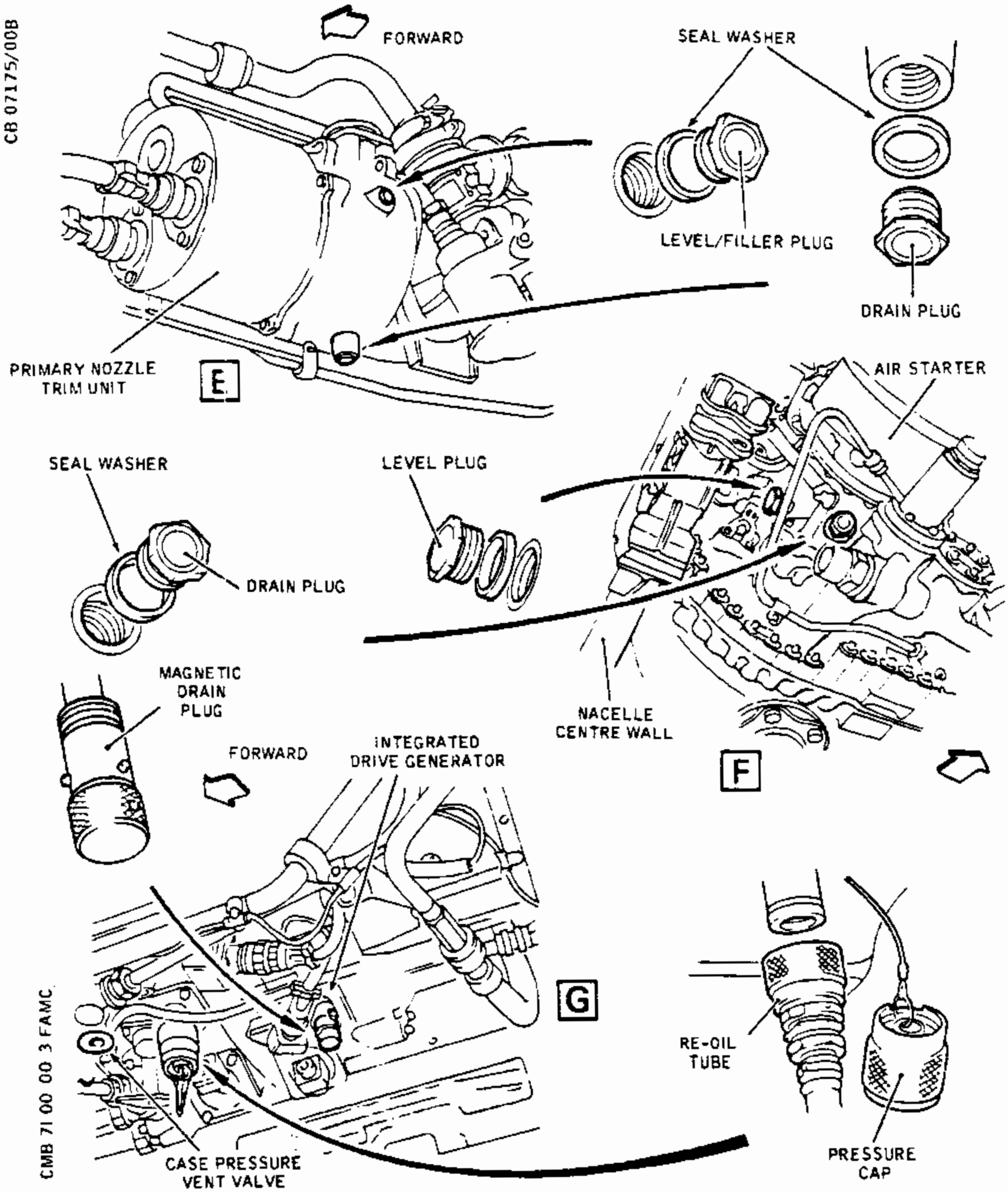
Power Plant Oil Drainage (Sheet 2 of 3)
Figure 306

R



R Power Plant Oil Drainage (Sheet 3 of 3)
Figure 306

10. Integrated Drive Generator (IDG) - Oil Drainage
(Ref. Fig.306)

A. Equipment and Materials

DESCRIPTION	PART NO.
Drainage adapter, for draining oil from the IDG. (Required to lift an internal self-sealing valve when the magnetic drain plug is removed).	E925084000
Container, 2 gal (9 litres)	-

B. Prepare to Drain

(1) Open the engine bay forward lower door (Ref. para.4).

C. Drain IDG (Detail G)

CAUTION: ENSURE THAT THE MAGNETIC DRAIN PLUG IS PROTECTED FROM EXTERNAL CONTAMINATION AND ISOLATED FROM FERROUS METAL AND OTHER MAGNETIC PLUGS.

(1) Place a suitable container beneath the IDG magnetic drain plug to receive the IDG oil content.

(2) Vent the IDG case by pressing in the case pressure vent valve.

(3) Clean the area around the magnetic drain plug.

(4) Remove the magnetic drain plug by pressing in, rotating counter-clockwise and gently withdrawing it.

NOTE: The close fitting of the magnetic drain plug sealing rings may cause some resistance to be felt while the plug is being withdrawn.

(5) Inspect the magnetic drain plug for contamination (Ref. 24-11-11, Inspection/Check).

(6) Using the drain adapter to lift the internal self-sealing valve, drain oil from the magnetic drain plug location into the container.

(7) Ensure that two serviceable sealing rings are fitted to the magnetic drain plug, then refit the plug by pressing it in and rotating it clockwise. Ensure that the plug is correctly installed by checking that the three indentations on the plug coincide with those on the self-sealing valve body.

(8) Close the case pressure vent valve by pulling it out to its full extent.

11. Primary Nozzle Trim Unit - Oil Drainage (Ref. Fig.306)

A. Equipment and Materials

DESCRIPTION	PART NO.
Container, 2 pints (1.5 l) capacity	-
Oil, DERD 2497 (Ref. 20-30-00, No.21)	-
Torque spanner, range 0-150 lbf in; (1.5 mdaN)	-

B. Prepare to Drain

CAUTION: AFTER DRAINING, THE LEVEL/FILLER PLUG IS TEMPORARILY FITTED IN PREPARATION FOR OIL REPLENISHMENT (REF. 12-13-76).

(1) Open the appropriate engine bay forward and rear lower doors (Ref. para.4).

C. Drain Trim Unit (Detail E)

(1) Remove the level/filler plug and seal washer from the trim unit.

(2) Position a suitable container below the trim unit.

(3) Remove the drain plug and seal washer, and allow oil to drain for at least 5 minutes. Discard the drained oil.

(4) Remove and discard the seal washer from the drain plug. Visually inspect the plug for cleanliness and damage, and position a new washer on the plug.

(5) Lubricate the threads of the drain plug with oil, DERD 2497, and refit the plug. Torque load the plug to between 120 and 130 lbf in (1.36 and 1.47 mdaN).

(6) Ensure that the level/filler plug is clean; temporarily refit the seal washer and plug to the trim unit.

12. Engine Bay Doors - Opening (Emergency Method)

CAUTION: DO NOT USE PERCUSSION TOOLS TO DEPRESS THE RED INDICATOR BUTTON OF THE ROTARY LATCH OTHERWISE DAMAGE TO THE LATCH MECHANISM WILL OCCUR.

A. General (Ref. Fig. 303)

Pin latches and rotary latches securing the engine bay forward and rear doors each consist of a mechanically operated locking bolt which engages with the adjoining structure. If the locking bolt fractures with the door retained in the closed position, open the door in accordance with the procedures in para.12B, C and D, as appropriate.

B. Forward and Rear Lower Door Opening (Centrewall Pin Latch Failure)

(1) Prepare to open the lower door (Ref. para.4).

(2) Determine which pin latch has failed, then ensure that all serviceable latches fully engage the door.

(3) Open the appropriate lower door in the adjoining engine bay for access to the failed latch (Ref. para.4).

(4) Support the door with the failed pin latch and manipulate the fractured locking bolt out of engagement with the centrewall bracket.

(5) Open the door.

(6) Remove the failed pin latch and install a serviceable one in its place.

C. Forward Door Opening - Lower Door and Side Panel (Rotary Latch Failure).

(1) Prepare to open the lower door (Ref. para.4) or the lower door and side panel (Ref. para.5).

(2) Determine which rotary latch locking bolt has failed. Using the latch key, operate the latch mechanism to the 'open' position (Ref.para.4) to provide longitudinal clearance in which to move the fractured part of the locking bolt.

(3) Ensure that all serviceable door latches fully engage the door.

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(4) If the failed rotary latch is on the forward edge of the lower door or side panel:

(a) Drill out the rivets securing the tongue to the outer skin nearest to the failed latch.

(b) Support the door to relieve the load on the locking bolt and, using a suitable tool, manipulate the fractured part of the bolt out of engagement with the intake.

(5) If the failed rotary latch is on the rear edge of the lower panel:

(a) Take the weight of the forward and rear lower doors and release all serviceable latches.

(b) Slowly allow the two lower doors to hinge downward simultaneously until there is sufficient access to the inner surface of the forward door to remove the latch cover plate; remove the cover plate.

(c) Manipulate the fractured part of the locking bolt out of engagement with the rear lower door.

(6) If the failed rotary latch is on the rear edge of the side panel:

(a) Support each of the forward and the rear lower doors and release all latches, in turn; lower the doors. Allow the doors to hang on their hinges.

(b) Release the rotary latch locking bolt on the forward edge of the forward side panel and the aft edge of the rear side panel.

(c) Carefully hinge the two adjoining side panels outward simultaneously until there is sufficient access to the inner surface of the forward side panel to remove the latch cover plate; remove the cover plate.

(d) Manipulate the fractured part of the locking bolt out of engagement with the rear door side panel.

(7) Open the door to the required position and secure it with the strut or screwjack/stay as necessary (Ref. para.4 or 5).

(8) Refit the tongue, if previously removed, to the door outer skin and secure it with rivets.

(9) Remove the damaged rotary latch, thoroughly clean the area and install a serviceable rotary latch (Ref. 54-32-16, Removal/Installation).

D. Rear Door Opening - Lower Door and Side Panel (Rotary Latch Failure).

(1) Prepare to open the lower door (Ref. para.4) or the lower door and side panel (Ref. para.5).

(2) Determine which rotary latch locking bolt has failed. Using the latch key, operate the latch mechanism to the 'open' position (Ref. para.4) to provide longitudinal clearance in which to move the fracture part of the locking bolt.

(3) Ensure that all serviceable door latches fully engage the door.

(4) Remove the fractured part of the rotary latch locking bolt:

(a) Drill out the rivets securing the tongue to the door outer skin nearest to the failed locking bolt.

(b) Support the door to relieve the load on the locking bolt and, using a suitable tool, manipulate the fracture part of the locking bolt out of engagement with the exhaust structure.

(5) Open the rear door to the required position and secure it with the strut or screwjack/stay (Ref.para. 4 or 5).

(6) Refit the tongue, if previously removed, to the door outer skin and secure it with rivets.

(7) Remove the damaged rotary latch, thoroughly clean the area and install a serviceable rotary latch (Ref. 54-32-16, Removal/Installation).

END OF THIS SECTION

NEXT

1. General

Deactivation and reactivation procedures for items in the associated section of the Manufacturers Minimum Equipment List (MMEL) are included in this topic.

2. Three Engine Ferry

WARNING: OBSERVE THE SAFETY PRECAUTIONS FOR ENTERING THE ENGINE AIR INTAKE (REF.71-00-00, SERVICING).

A. General

A failed engine can be returned to base while installed provided that it is not used, and the engine and installation are cleared for flight. Checks required for clearance, and checks and limitations necessary to establish the permitted condition of the engine, which would be either free to autorotate/windmill or have the rotating assemblies immobilized mechanically, are specified (Ref. 05-58-11). Immobilization of the rotating assemblies is essential where further damage could be caused by autorotation/windmilling.

The control channel associated with the unserviceable engine in the engine speed unit on rack 1-215 must be fed with a false N2 signal to prevent triggering of the automatic contingency rating selection system by the unserviceable engine during operation of the remaining three engines.

R Procedures for engines which have been the subject of
R overspeed and surge, or emergency shut-down, are detailed
R in 71-00-00, Inspection/Check.

B. Equipment and Materials

DESCRIPTION	PART NO.
Engine immobilizer kit	S3S.15496000
Electrical harness*:	
No.1 engine unserviceable	-
No.2 engine unserviceable	-

DESCRIPTION	PART NO.
No.3 engine unserviceable	-
No.4 engine unserviceable	-
Self-adhesive linen tape	-
Clean engine oil for lubricating HP compressor immobilizing fixture	-
Torque spanner range 0-75 lbf in (0-0.84 mdaN)	
Adapter assembly for air drying bearings in main engine and gearboxes	S3S.15668000

*Electrical harness to be manufactured as necessary (Ref.Fig.403).

C. Preparation

(1) Open the appropriate engine bay forward and rear doors (Ref.71-00-00, Servicing).

(2) Prepare to enter the intake of the failed engine (Ref.71-00-00, Servicing).

(3) Whether the failed engine is autorotating/windmilling or immobilized, all loose debris from the engine must be removed and despatched to the Operator's Engineering Department.

D. Prepare an Acceptable Failed Engine for Flight in Autorotation/Windmilling Condition.

(1) Confirm that engine had normal oil pressure prior to shut-down and that main engine oil pump is operational.

(2) Confirm that oil consumption rate will ensure an adequate oil supply for each ferry stage.

(3) Check engine oil system for possible leaks.

R (4) Confirm that no excessive vibration was felt

R prior to or following engine shut-down and during windmilling.

(5) Confirm that both rotor systems rotate freely with no evidence of physical damage.

(6) Verify that all filters and the magnetic plugs have been checked for metal contamination and found satisfactory.

(7) Check aircraft intake and engine exhaust assembly for freedom from evidence of engine damage or metal.

(8) Replenish the oil system and oil tank as required after filter removal and ensure oil supply for ferry flight (Ref.12-13-79 and 72-01-00).

(9) Manually operate the air start valve to the 'manual locked closed' position (Ref.80-11-12, Adjustment/Test).

E. Lock Thrust Reverser Buckets and Immobilize Rotating Assemblies.

(1) Lock the thrust reverser buckets at 10 deg position (Ref.78-00-00, Removal/Installation).

(2) Immobilize the HP compressor rotor (Ref.Fig.401):

(a) Remove the air starter without the shut-off valve (Ref.80-11-11, Removal/Installation).

(b) Assemble the immobilizing quillshaft to the gearbox:

(b1) Engage the smaller diameter end of the quillshaft with the driving shaft at the air starter location. If the air starter drive is locked because of engine or component seizure, position the quill-shaft so that the red datum line is approximately at top dead centre.

(c) Remove the protectors from the immobilizing fixture.

(d) Assemble the seal from the removed air starter to the groove in the immobilizing fixture.

(e) Assemble the immobilizing fixture to the gearbox:

(e1) With the assembly pins aligned with their locations, engage the fixture with the quillshaft splines.

(e2) Align the QAD coupling ring with its thread sections facing the slots on the fixture thread and the spherical nut trunnion to engage the clamp bolt when the ring is tightened.

(e3) Press the fixture rearward over the quillshaft splines until the assembly pins engage with their locations. If free engagement is obtained, press the fixture into full abutment of mating faces without undue force. If free engagement is not obtained, use the following aligning procedure according to engine condition.

(e4) On a failed engine free to turn, reposition the quillshaft by turning the engine the minimum amount necessary to obtain simultaneous free engagement of shaft and assembly pins.

(e5) On a failed engine not free to turn, carry out the repositioning procedure of sub-paragraph (f) below.

(f) Reposition the quillshaft to obtain simultaneous engagement of the shaft splines and assembly pin:

(f1) Remove the immobilizing fixture from the quillshaft.

(f2) Withdraw the quillshaft from the gearbox and re-assemble with the datum line positioned one spline clockwise from the first position.

(f3) With the assembly pins aligned with their locations, engage the fixture with the quillshaft splines.

(f4) Ensure that the QAD coupling ring thread sections face the slots on the fixture thread, and that the spherical nut trunnion is located to engage the clamp bolt when the ring is tightened.

(f5) Press the fixture rearward over the quillshaft splines until the assembly pins are engaged with their locations. If each assembly pin does not align with its location, repeat the alignment procedure until the shaft is assembled in a position where the fixture can be pressed into full engagement of the mating faces without undue force.

(g) Position the fixture flange in full contact with the air shut-off valve flange.

(h) Secure the immobilizing fixture to gearbox:

(h1) Apply lubricant A (Ref.70-00-01, Servicing and Storage Materials) to the threads of the coupling clamp bolt.

(h2) With the immobilizing fixture pressed quarely into position and the joint faces abutting, turn the coupling ring counter-clockwise to bring the trunnions together, and engage the threads of the ring with those of the threaded flange as far as possible by hand.

CAUTION: ENSURE THAT THE THREADS HAVE ENGAGED FREELY BEFORE APPLYING TIGHTENING FORCE TO RING.

(h3) Position the spherical washer on the clamp bolt, then insert the bolt through the fixed locking trunnion to engage the threads of the coupling ring spherical nut by hand.

(h4) Tighten the coupling ring (Ref.70-00-06, QAD Coupling Installation). Use the following locking (run-down) torque and torque tightening values for the clamping bolt:

Locking (run-down) torque to be within the limit 6 to 20 lbf in. (0.068 to 0.226 mdaN).

Nominal tightening torque to be between 170 and 190 lbf in. (1.921 and 2.147 mdaN).

(j) Connect the vent tube to the fixture and torque-

tighten the union nut to between 40 and 65 lbf in (0.45 and 0.73 mdaN). Wire-lock the union nut.

(k) Secure the immobilizing fixture to the air shut-off valve:

(k1) Ensure that the assembly pin in the valve flange is engaged with the hole in the immobilizing fixture.

(k2) Locate the clamp centrally on the flange joint and secure the clamp with the nut torque-tightened to between 50 and 60 lbf in (0.565 and 0.678 mdaN).

(k3) Ensure that the air start valve is in the 'manual locked closed' position (Ref.80-11-12, Adjustment/Test).

(l) Reset the circuit breakers tripped before removal of starter (Ref.80-11-11, Removal/Installation).

(m) Close the engine bay door (Ref.71-00-00, Servicing).

(n) Assemble the protectors to the previously removed air starter and pack them in the box from which the fixture was removed; return the box, complete with starter.

(3) Immobilize LP compressor rotor (Ref. Fig. 402):

(a) Prepare the aircraft intake for entry (Ref. 71-00-00, Servicing).

(b) Ensure that the clips are serviceable and assemble them to the blades at the lower strapping position.

(b1) On an engine free to turn, position the rotor blades relative to the stator vanes as shown (view in direction of arrow B).

(b2) Assemble a strap retaining clip to the tips of the two adjacent blades as shown (detail D).

(b3) Assemble a buckle retaining clip to the tip of the third blade as shown (details C and E).

(c) Identify the rotor and stator blades at the lower strapping position.

CAUTION: DO NOT USE ANY OTHER TYPE OF MARKING MATERIAL.

(c1) Use tailors chalk or rapid drying ink from a felt point pen and mark the lst stage rotor blades and stator vanes with corresponding identification numbers and letters to those shown in (Ref. Fig. 402) on the view in direction of arrow B. Position the markings where they will not be obscured by the immobilizing strap.

(d) Install the immobilizing strap at the lower strapping position.

(d1) Remove the lock bolt and nut from the buckle of the immobilizing strap.

CAUTION: ROUTE THE IMMOBILIZING STRAP STRICTLY AS SHOWN, WITHOUT TWISTING. ERRORS IN ROUTING COULD IMPAIR IMMOBILIZING EFFICIENCY.

(d2) Commencing with the buckle positioned on the buckle retaining clip as near to the blade trailing edge as possible, route an immobilizing strap around seven lst stage stator vanes and three lst stage rotor blades in the directions shown and locate the strap in the retaining clips.

(d3) Depress the locking lever, thread the strap through the buckle and allow the lever to return. Tighten the strap and check that it is firmly locked in the buckle.

(d4) On an engine free to turn, move the rotor assembly as far as possible, first clockwise then counter-clockwise and repeat this motion while progressively tightening the strap until all slackness is eliminated and no further movement is obtainable on the rotor. On completion of this sequence, ensure that the strap is firmly locked in the buckle and that the buckle is located on the clip.

NOTE: During the strap tightening procedure, the rotor assembly will settle approximately twenty degrees from the original set position.

(d5) Ensure that all retaining clips are held firmly against blade tips, check that the strap is correctly routed and tensioned sufficiently to immobilize the rotor, then insert the lock bolt into its location in the buckle, passing behind the locking lever. Screw the nut onto the lock bolt and securely tighten it.

(d6) Retain surplus strap length to the secured strap with two electrical tywraps.

(e) Assemble strap and buckle the retaining clips to the rotor blades at the two remaining strapping positions shown in (Ref. Fig. 402) and, at each position, install an immobilising strap in accordance with the procedure of paragraphs (c) and (d).

(f) Remove all temporary identification markings from rotor blades and stator vanes.

(g) Vacate the engine air intake and close the engine bay forward and rear doors (Ref. 71-00-00, Servicing).

F. Deactivation of Autocontingency Rating Selection System for Unserviceable Engine

(1) Remove the engine speed unit (Ref. 24-22-22, Removal/ Installation).

(2) Remove two diagonally-positioned screws securing the rack connector.

(3) Check that the electrical connectors on the unit and on the rack are clean and undamaged, then connect the appropriate electrical harness (Ref. Fig. 403) to the unit and the rack connector. Secure the harness plug (3) to the rack connector with two screws, and the plug (1) to the speed unit with self-adhesive tape.

(4) Install the engine speed unit in temporary location:

(a) Comply with the electrical safety precautions.

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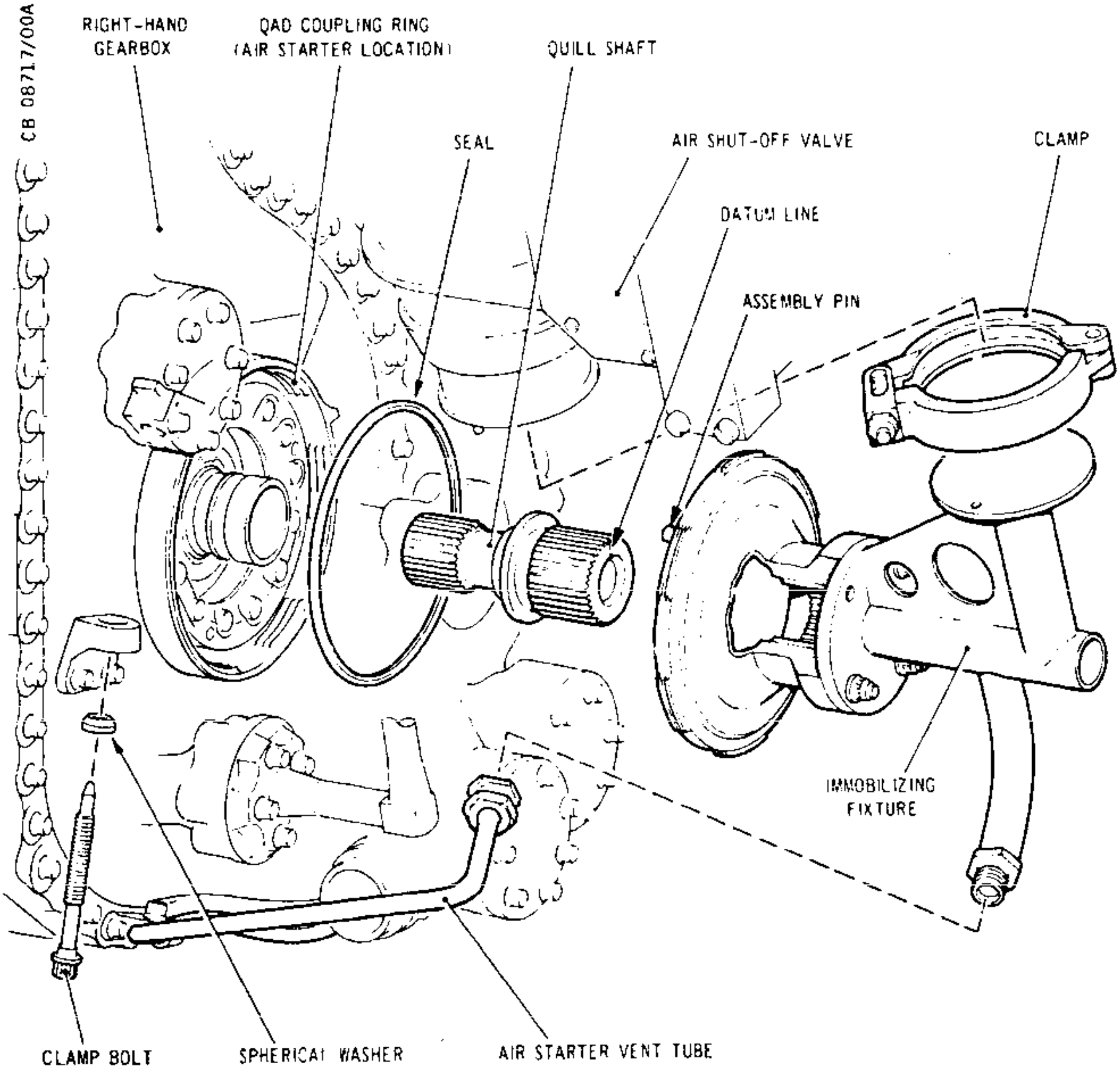

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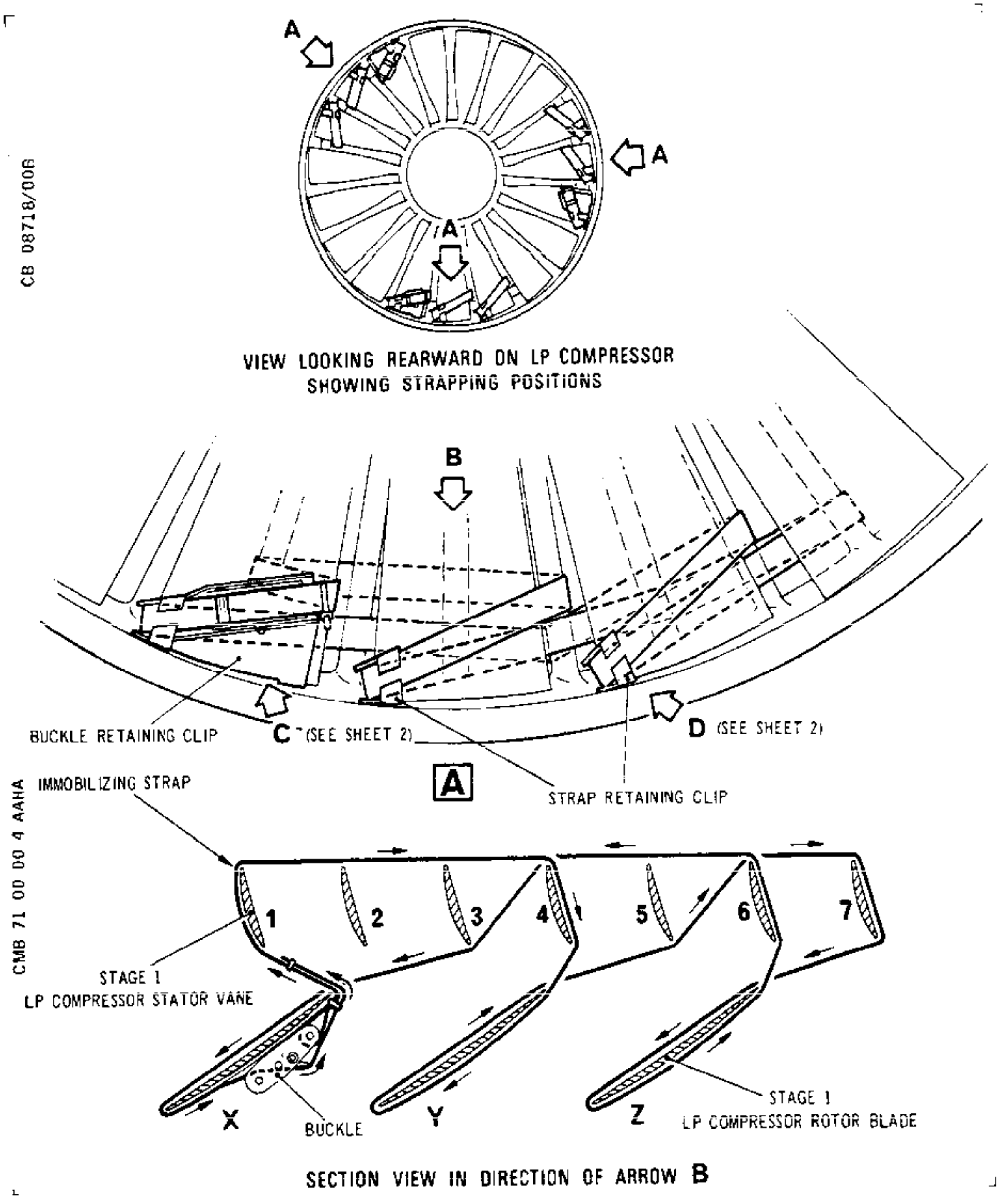
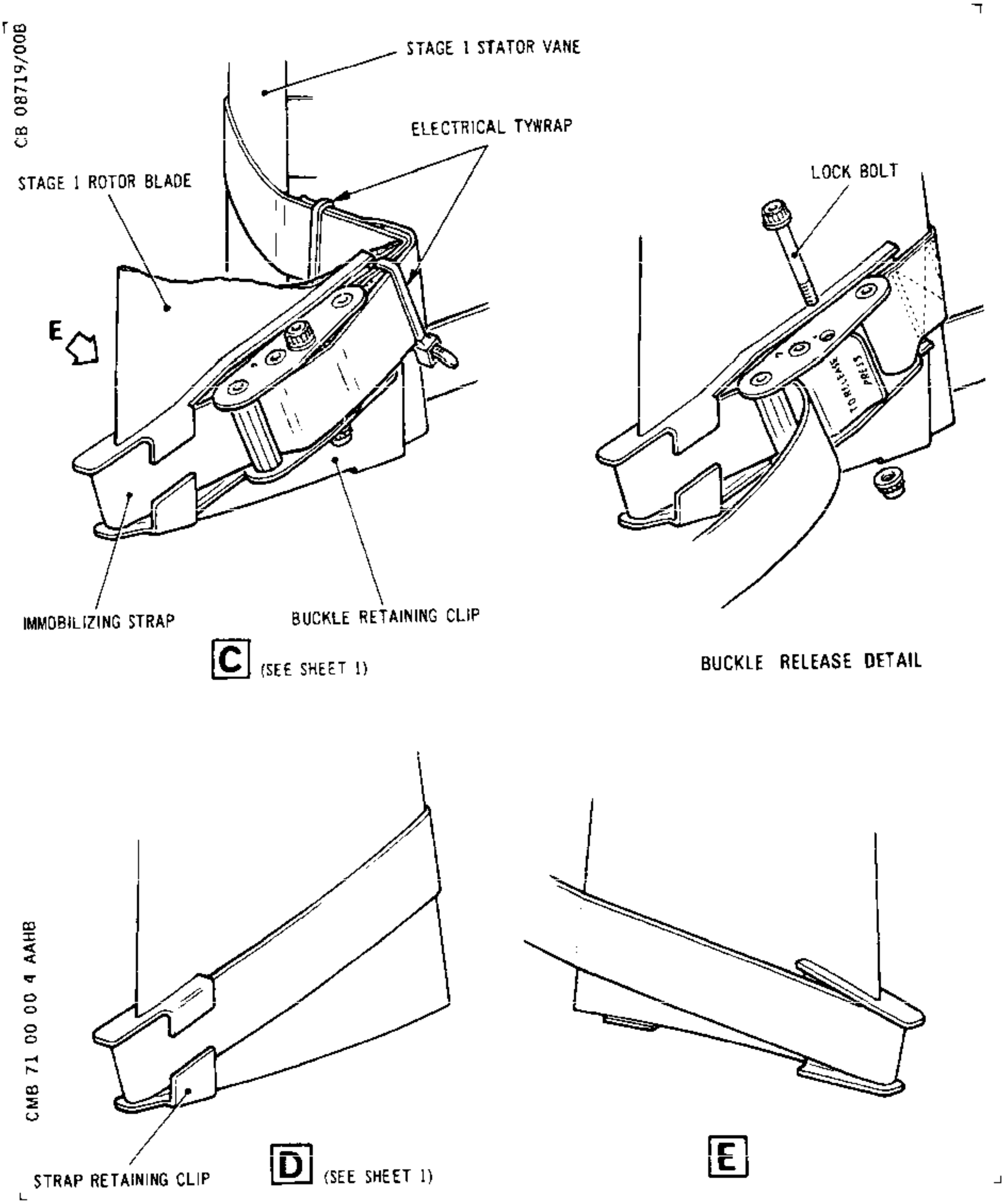
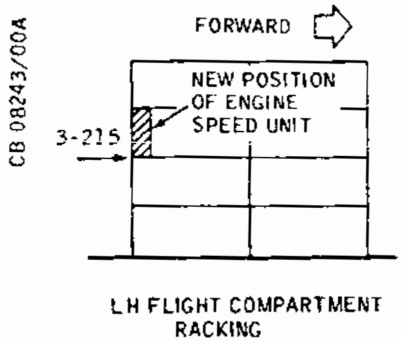
Immobilization of Engine HP Compressor
Figure 401



Immobilization of Engine LP Compressor
(Sheet 1 of 2)
Figure 402

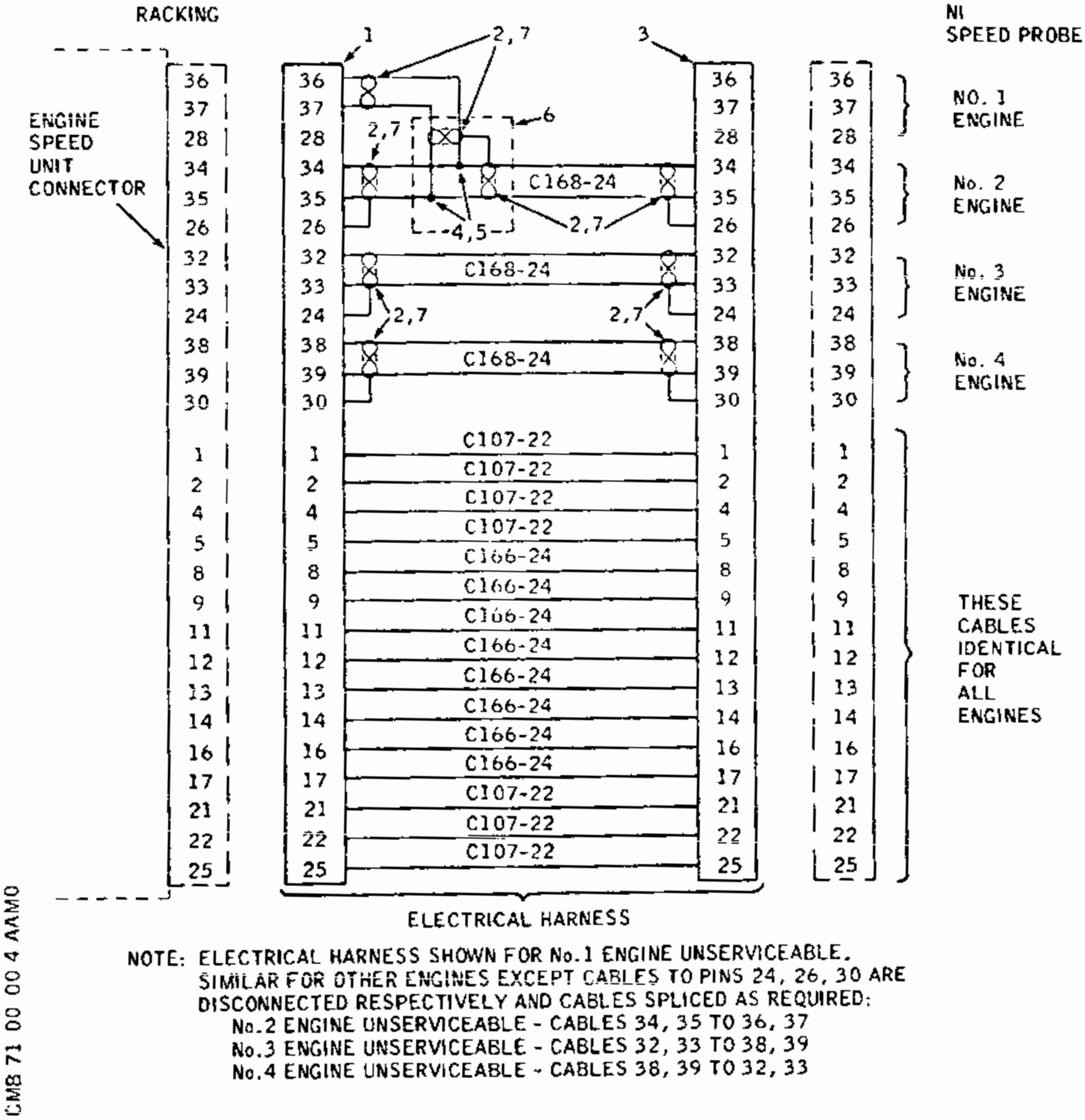


Immobilization of Engine LP Compressor
(Sheet 2 of 2)
Figure 402



ITEM	DESCRIPTION	TYPE	WDM REF.
1	PLUG	BAS 7536V96	—
2	SCREEN LINK	C166-24	—
3	PLUG	DP X BMA40-34-0196	—
4	SPLICE	T025-03	20-42-19
5	SLEEVE	M004-04	20-41-14
6	SLEEVE	M007-07	20-41-14
7	SLEEVE	D101	20-42-22

NOTE: HARNESS TO BE 120 in. (3000 mm) LONG (APPROX.)



NOTE: ELECTRICAL HARNESS SHOWN FOR No.1 ENGINE UNSERVICEABLE. SIMILAR FOR OTHER ENGINES EXCEPT CABLES TO PINS 24, 26, 30 ARE DISCONNECTED RESPECTIVELY AND CABLES SPLICED AS REQUIRED:
- No.2 ENGINE UNSERVICEABLE - CABLES 34, 35 TO 36, 37
- No.3 ENGINE UNSERVICEABLE - CABLES 32, 33 TO 38, 39
- No.4 ENGINE UNSERVICEABLE - CABLES 38, 39 TO 32, 33

Make-up of Electrical Harness
Figure 403

(b) Locate the unit in the new position on shelf 3-215 (Ref. Fig. 403), ensuring that the new electrical harness is not trapped between the unit and the rack structure. Secure the unit in position with self-adhesive tape and suitable rubber packing blocks.

CAUTION: THE NEW LOCATION IS LARGER THAN THE UNIT CASE, THEREFORE USE SUFFICIENT TAPE TO ENSURE THAT THE UNIT IS SECURELY RETAINED.

NOTE: Ensure that the unit is electrically bonded to the rack.

(c) Refit the LH racking panel.

(d) Remove the safety clips and reset the circuit breakers previously tripped.

(e) Remove the warning placard from the flight compartment. Do not test at this stage.

(5) Connect electrical ground power (Ref. 24-41-00).

(6) Check that the SECONDARY NOZZLE position indicator, of the affected power plant, on panel 1-214, reads 10°.

(7) Check that the oil quantity indicator, of the effected power plant, on panel 4-214 shows 17 QTS. If necessary, replenish the engine oil tank (Ref. 12-13-79).

(8) Test the new installation (Ref. para.D).

G. Test Following Deactivation of the Autocontingency Rating Selection System for Unserviceable Engine

NOTE: If No.1 engine is unserviceable, disregard Operations (2), (4) and (5).

If No.2 engine is unserviceable, disregard Operations (7) and (8).

(1) Carry out a static test on the autocontingency rating system for any serviceable engine:

(a) Ensure that the throttle lever is at 'idle'.

(b) Set the reheat control switch on panel 9-211

to "ON", and press the T/O MONITOR arming button on panel 6-211; check that the "CTY" caption, on panel 2-211, flashes.

(c) Pull out the arming button and check that the caption extinguishes.

(d) Set the reheat control switch to "OFF".

(2) With the THROTTLE MASTER control switch, associated with No.1 engine on panel 4-211 at MAIN, start and run that engine at a speed 62 per cent N2 (Ref. 71-00-00, Adjustment/Test). Check that, as the engine speed increases to 30 per cent N2 approximately, the associated START/RELIGHT switch on the engine starting panel returns to the centre-off position.

(3) Repeat operation (2) for the other serviceable engines, then shut-down those engines.

(4) With No.1 engine exceeding 62 per cent N2, check that the auto-shed breaker (ASB) magnetic indicator displays in-line.

(5) Set the emergency generator mode switch to GND BY-PASS and check that the emergency generator SELECTED caption is not illuminated, indicating that the emergency generator is inoperative.

(6) Shut-down No.1 engine so that the speed falls below 58 per cent N2. Check that:

(a) the emergency generator starts,

(b) the emergency generator SELECTOR caption illuminates,

(c) the ASB magnetic indicator changes to cross-line,

(d) the emergency generator FAIL caption illuminates after a short period.

NOTE: The pressurizing supply for the green hydraulic system is provided by No.1 and/or No.2 engine-driven pump(s). When these two engines are shut-down, or one of these is the unserviceable engine, power to sustain operation of the emergency generator will be lost. Residual pressure in the system will, however,

enable the emergency generator to start and run at normal operating speed for a short period, after which the decay of system pressure will result in generator run-down and the illumination of the emergency generator FAIL warning caption.

(7) Start No.2 engine and when the speed rises above 62 per cent N2 check that:

(a) the emergency generator SELECTED caption is extinguished, indicating that the emergency generator is not running,

(b) the emergency FAIL caption is extinguished,

(c) the ASB magnetic indicator displays in-line.

(8) Repeat operation (6) for No.2 engine.

(9) Set the emergency generator mode switch to "AUTO", then set the emergency generator isolate switch to "ISOL". Return the emergency generator isolate switch to "NORM" and check that the emergency generator SELECTED and FAIL captions are extinguished.

(10) Switch off and disconnect electrical ground power (Ref. 24-41-00).

H. Recommissioning Engine After Three Engine Ferry Flight.

(1) After Autorotation/Windmilling Ferry Flight.

(a) Carry out the procedures applicable to Inspection of Engine after Shut DoWn (Windmilling) in Flight (Ref. 71-00-00, Inspection/Check).

(2) After Engine Immobilized Ferry Flight.

(a) Remove the LP compressor immobilizing equipment (Ref. Fig. 402).

WARNING: OBSERVE THE SAFETY PRECAUTIONS FOR ENTERING AND VACATING THE ENGINE AIR INTAKE (REF. 71-00-00, SERVICING).

CAUTION: ENSURE THAT ALL PARTS OF THE IMMOBILIZER KIT ARE ACCOUNTED FOR, AS LISTED ON THE LABEL ATTACHED TO THE SPECIAL CONTAINER.

(a1) If the engine is installed, prepare the air intake for entry (Ref. 71-00-00, Servicing).

(a2) Remove the electrical tywraps.

(a3) Release and remove the buckles, strap retaining clips and immobilizing straps.

(a4) Remove the equipment from air intake (Ref. 71-00-00, Servicing).

(b) Remove the HP compressor immobilizing equipment (Ref. Fig. 401).

(b1) Detach the immobilizing fixture clamp from the air shut-off valve.

(b2) Disconnect the air starter vent tube from the fixture.

(b3) Unscrew and remove the bolt and spherical washer from the locking trunnion.

(b4) Use an approved drift against the flat face of the release anvil and drive the QAD coupling ring in the direction to separate the trunnion, until loosened.

(b5) Support the fixture, turn the coupling ring until the threads disengage and align with their withdrawal slots and remove, taking care not to dislodge the quillshaft.

(b6) Remove the immobilizing quillshaft.

(b7) Assemble the air starter as described in 80-11-11, Removal/Installation.

(b8) Assemble the protectors to the immobilizing equipment and place in the container.

(3) Reactivate the autocontingency rating selection system for four engine service, as follows:

(a) Remove the engine speed unit from rack 3-215 in a similar manner to the procedure detailed in 24-22-22, Removal/Installation. Remove and discard the self-adhesive tape and the rubber packing blocks used to retain the unit.

(b) Remove the electrical harness (Ref. Fig. 403).

(c) Install the engine speed unit in its correct position (Ref. 24-22-22, Removal/Installation).

R (4) Reactivate the thrust reverser bucket control system as detailed in 78-00-00, Removal/Installation if required.

R (5) Ensure aircraft recommissioning and the engine recommissioning detailed in 71-00-00 Inspector/Check and 71-00-12 Removal/Installation are satisfactorily completed.

R (6) Ground run the engine (Ref. 71-00-00, Adjustment/Test) at a power setting above 90% N2 for 10 minutes and to maximum power for approximately 10 seconds.

R (7) After completion of the ground run:

R (a) Examine the magnetic plugs for debris (Ref. 72-01-00, Inspection/Check).

R (b) Carry out a spectrometric analysis of an oil sample (Ref. 79-00-03) on each of the next five returns to base after a round trip.

R J. Air Drying of Bearings in Main Engine and Gearboxes Following Three Engine Ferry (Ref. Fig. 404)

R NOTE: An engine that has been ferried in the immobilized condition is likely to have condensation in contact with corrodable materials in the bearings. Carry out the air drying procedure in accordance with the following conditions:

R (a) Where the airfield temperature is above zero and there is no ice in the engine, air dry the bearings within five hours of landing irrespective of whether the engine is installed or removed.

R (b) Where the airfield temperature is sub-zero or if ice is evident in the engine, the engine must remain in an environment with an ambient air temperature above 10 deg.C (50 deg.F) for five hours before commencing the air drying procedure.

R (Sheet 1 of 3)

R (Sheet 2 of 3)

R (Sheet 3 of 3)

R (1) Install air drying equipment on engine.

R (a) Open the engine bay lower doors (Ref.71-00-00, Servicing).

R (b) Install the adapter at the LP compressor front bearing oil scavenge tube filter location (Ref. Detail A):

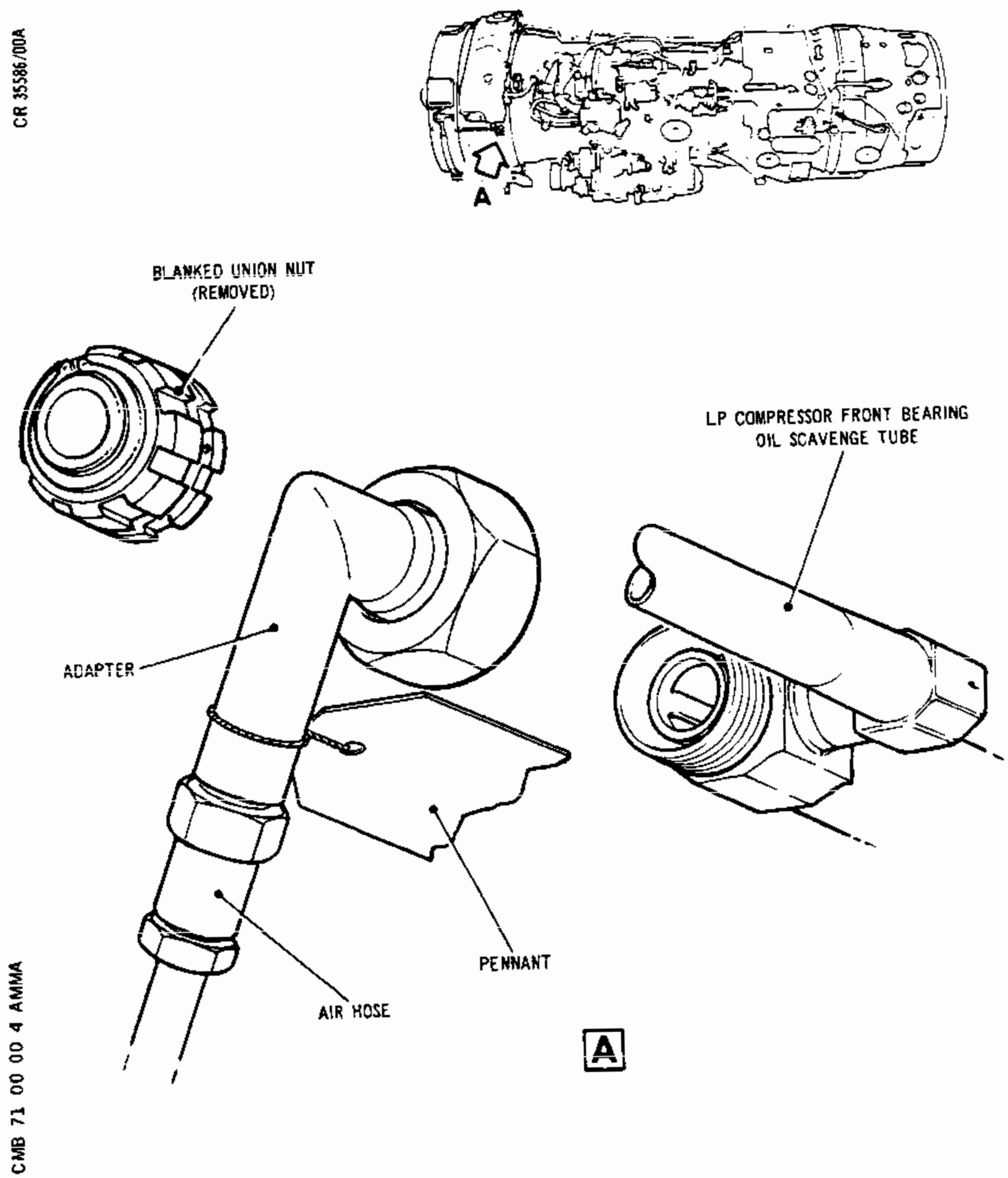
R (b1) Clean the union nut and surrounding area of scavenge filter location.

R (b2) With a container positioned to catch oil drainage, remove the blanking ferrule union nut.

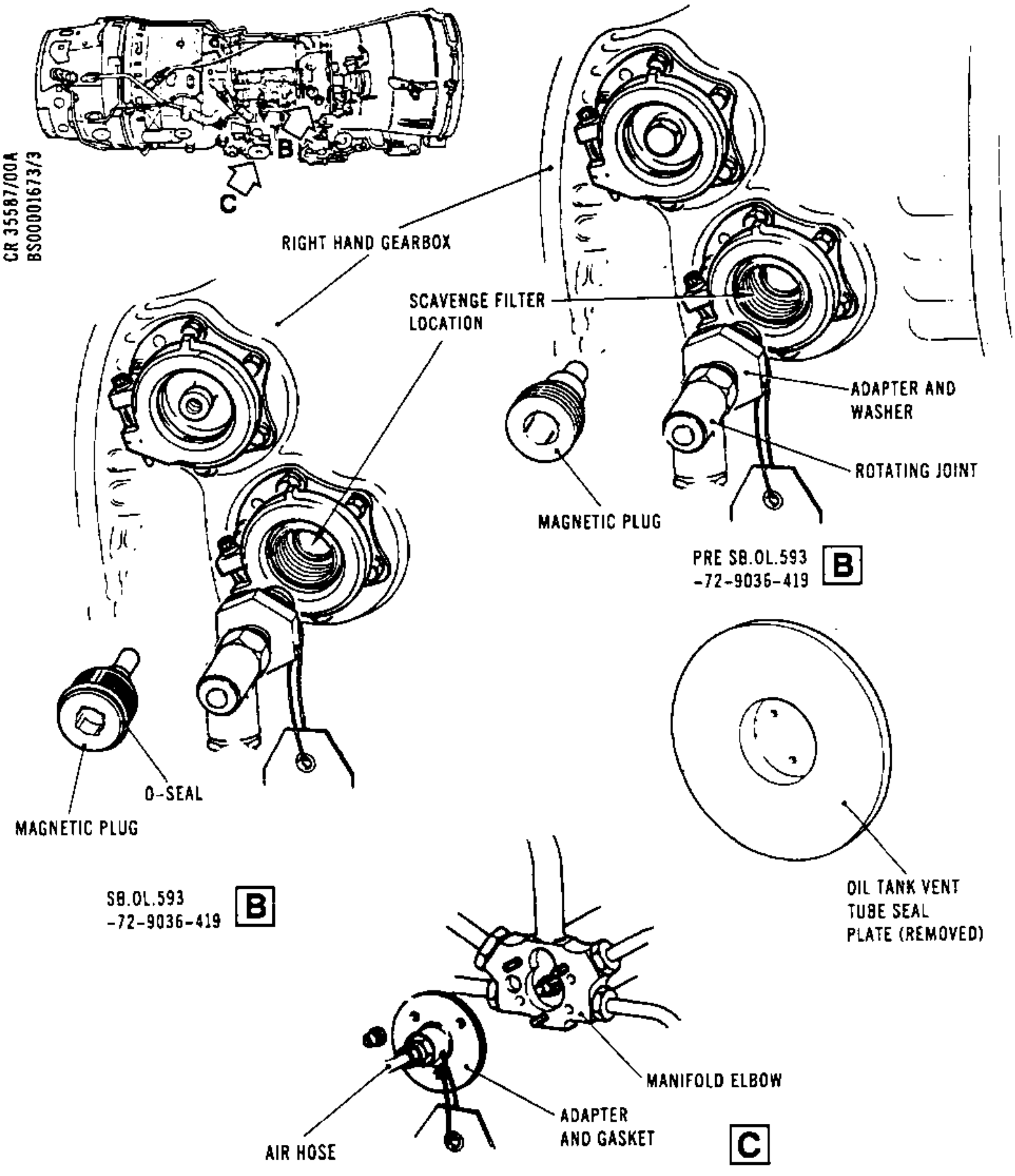
R (b3) Engage the adapter union nut with filter location and tighten securely. Do not exceed 500 lbf in. (56,5 N.m).

R (c) Install adapter in right-hand gearbox magnetic plug location (Ref. Detail B):

R (c1) Wipe the magnetic plug and surrounding



R Bearings Air Drying Adapters - Installation
Figure 404



R
R
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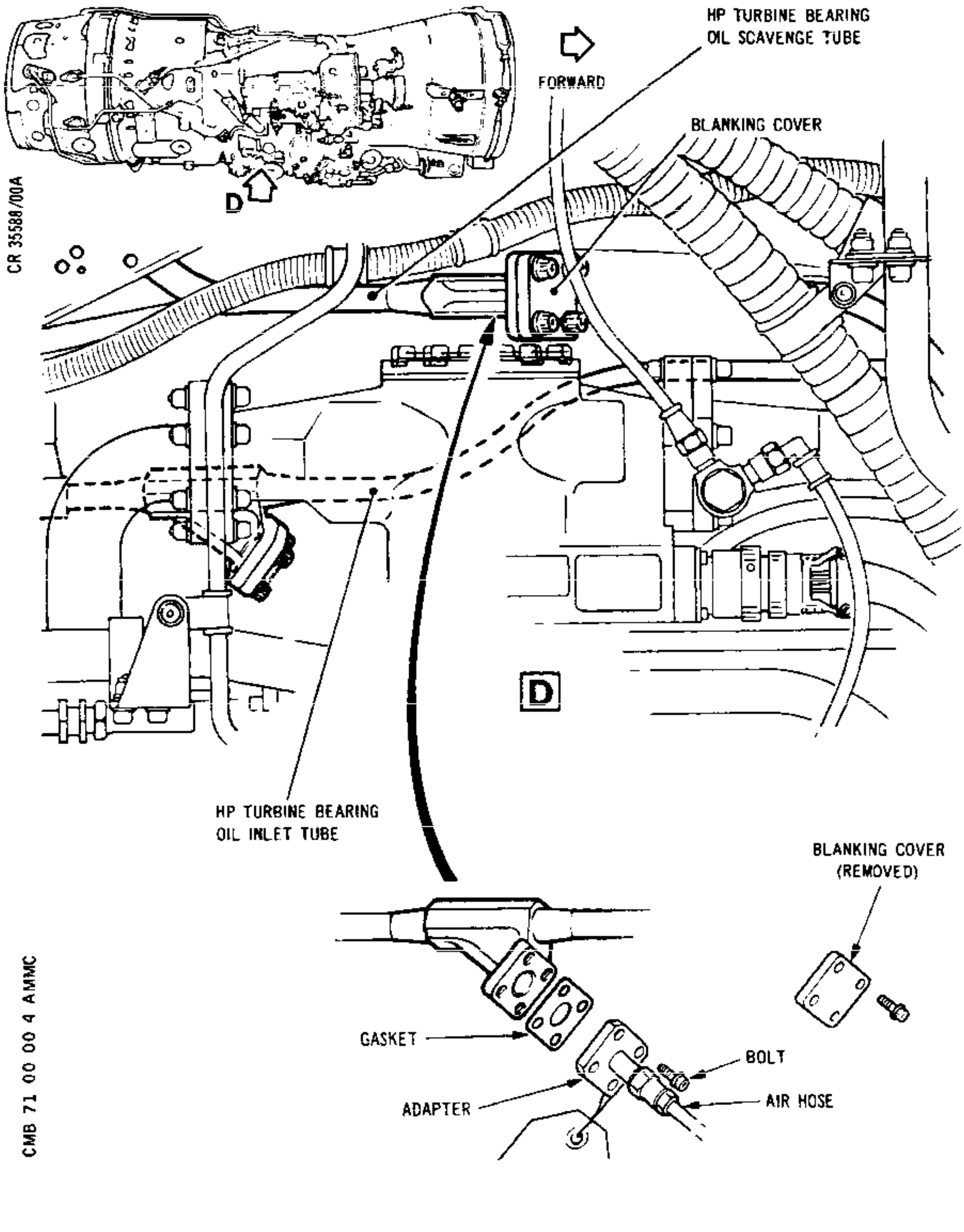
Bearings Air Drying Adapters - Installation
Figure 404



Bearings Air Drying Adapters - Installation
Figure 404

R

area clean.

(c2) Unscrew and remove the magnetic plug and ensure that the self-sealing valve in the drain valve is correctly seated. Take care that any debris adhering to the magnetic probe is not dislodged. Place a protective plastic sleeve over the magnetic portion of the plug, again ensuring that any adhering debris is not dislodged.

CAUTION: ENSURE THAT THE MAGNETIC PROBE IS PROTECTED FROM EXTERNAL CONTAMINATION AND ISOLATED FROM FERROUS METAL AND OTHER MAGNETIC PLUGS.

(c3) Place the plug in a clean container and forward for inspection, refer to Inspection/Check.

(c4) Drain the residual oil from the gearbox (Ref.79-00-01).

(c5) Locate the rotating joint adapter and washer in the magnetic plug position. Torque-tighten to 30 lbf ft (40 N.m).

(d) Install the adapter on the oil tank vent tube seal plate (Ref. Detail C):

(d1) Remove the three nuts securing the seal plate. Detach the seal plate from the manifold elbow.

(d2) Locate the adapter with gasket interposed, to the manifold elbow and secure using previously removed nuts, torque-tightened to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

(e) Install the adapter on the HP turbine bearing scavenge oil tube at the flanged location (Ref. Detail D).

(e1) Position a container to collect oil drainage.

(e2) Remove the attachment bolts and detach the blanking cover/thermometer (Ref.S.B.OL. 593-71-8579-24).

(e3) Assemble the adapter to the tube flange with the gasket between mating faces and secure them with the attachment bolts, torque-tightened to between 85 and 95 lbf in (9,6 and 10,7 N.m).

(f) Ensure the air hoses between the regulated air manifold and the four adapters are securely connected.

(2) Air dry the bearings:

(a) Connect a clean, dry air supply not exceeding 15 deg.C to the adapter assembly.

(b) Apply a low pressure supply of approximately 10-15 psi to the adapter assembly.

(c) Open the screw-down valve progressively until the pressure gauge shows an input reading of 5 psi. If necessary, increase supply pressure.

(d) Continue to apply dry air until all the bearings are dry. Application of drying air for 30 min. should be sufficient.

(e) Reduce delivery to zero, turn off air supply and disconnect from adapter assembly.

(3) Remove adapters and restore the engine to flight standard:

(a) Remove the adapter and install blanking cover/ thermometer (Ref. S.B.OL.593-71-8579-24):

(a1) Apply lubricant B (Ref. 70-00-01, Servicing and Storage Materials) to securing bolts.

(a2) Renew gasket and position blanking cover/ thermometer on HP turbine bearing oil scavenge thermometer elbow, and secure with four bolts.

(b) Remove the adapter and attach the oil tank vent tube seal plate:

(b1) Apply lubricant A to the bolt threads.

(b2) Assemble seal plate to manifold elbow with three bolts and nuts, torque-

tightened to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

(c) Remove the adapter and install the magnetic plug:

<u>NOTE:</u> A spring ring locking device housed in the drain valve body is effective during the final half turn of tightening of the magnetic plug.

<u>CAUTION:</u> IT IS OF THE UTMOST IMPORTANCE TO ENSURE THAT ALL MAGNETIC PLUG ASSEMBLIES ARE FULLY TORQUE-TIGHTENED ON ASSEMBLY. ALSO, WHEN FITTING ASSEMBLIES MODIFIED TO SB.OL.593-72-9036-419 STANDARD A SERVICEABLE 'O' SEAL MUST BE FITTED. FAILURE TO DO THIS CAN RESULT IN OIL LEAKAGE IN FLIGHT WHICH MAY NOT BE APPARENT DURING GROUND CHECKS/ RUNNING.

(c1) Apply lubricant A to plug then screw plug into its location.

(c2) Torque-tighten magnetic plug to 30 lbf ft. (40 N.m).

(d) Remove the adapter and install the union nut on the LP compressor front bearing scavenge filter position:

(d1) Ensure that the blanking ferrule and circlip are correctly assembled to the union nut and apply lubricant A. Assemble the blanked union nut to the filter housing.

(d2) Restrain the filter housing against turning and torque-tighten nut to 500 lbf in. (56 N.m).

(d3) Wire-lock the nut to oil tube elbow.

(e) Replenish the oil supply (Ref.12-13-79, Replenishing Oil Tank).

(f) Complete the procedure by closing the engine bay lower doors (Ref.71-00-00, Servicing).

3. Failed Ramp Actuator and Mechanism (MMEL Procedure)

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR

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HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

A. General

No specific deactivation procedures are applicable to the ramp actuator and mechanism for subsonic flight; the only requirement is that the ramps are fully raised and retained in that position.

The ramps can be raised by either one of two methods; the first, using the AICS inching facility, the second, by manually rotating the screwjack bodies, after releasing the actuator brake. Both methods are detailed in this topic.

B. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for spill door selector valves (No.2 and No.4 intakes)	E925037000
Locking pins, for spill door selector valves (No.1 and No.3 intakes)	E925038000
Anti-interference plate, for intake management panel	E925068000
*Brake release tool	E925089000
*Torque spanner, 133 to 177 lbf in (1.503 to 2.000 mdaN)	-
*Protective cover, for intake lip	D926806000
*Servicing extension (springboard)	-
*Work stand	-

DESCRIPTION	PART NO.
*Crawling board	-
*Cover, for engine transition ring	D935036001

NOTE: An asterisk (*) denotes the additional equipment needed to enter an intake and to manually raise the ramps.

C. Ramp Raising Procedure

(1) Prepare to Raise Ramps

(a) Ensure that the four intakes are clear of personnel and equipment.

(b) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(c) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out on the intakes.

(d) On the intake management panel (Ref. 71-61-00), proceed as follows:-

d1) Set the four RAMP/SPILL MASTER switches to "MAN".

d2) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

d3) Fit, and lock, the anti-interference plate.

(e) Remove the access panels 411 JL, 421 JR, 431 JL and 441 JR. Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(f) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(2) Raise Ramps, Using AICS Inching Facility

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) According to which hydraulic system is to be used and which ramps are being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.(1) (f)).

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(b) Make available electrical ground power as detailed in 24-41-00.

(c) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work in the intakes.

(d) At the intake management panel, remove the anti-interference plate; using the appropriate RAMP switch in an inching mode, fully raise the ramps (0 per cent indicated). Release the switch.

(e) Depressurize the hydraulic system.

(f) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(g) Trip the circuit breaker reset in operation (a) and fit a safety clip.

(h) Refit, and lock, the anti-interference plate to the intake management panel.

(i) Test the ramp actuator brake as detailed in paragraph (4).

(3) Raise Ramps, Manually

(a) Ensure that the safety precautions taken in

operation (1) have not been cancelled.

(b) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
Engine 4			
ENG 1 & 4 AIR CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 4 RH IGNITION CONT	1-213	4J2	R6

(c) Fit, and secure, the protective cover to the intake lip.

(d) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(e) Place the crawling board on the floor of the intake, aft of the servicing extension.

(f) Fit the cover to the engine transition ring.

(g) Remove the plug from the actuator brake unit (Ref. 71-63-11).

(h) Using the brake release tool as detailed on the attached instruction label, release the brake.

(i) Rotate the screwjack bodies until the ramps are fully raised.

(j) Using the brake release tool, following the instructions on the label in reverse order, engage the brake. Remove the brake release tool.

(k) Fit the plug to the brake unit; torque-tighten the plug to between 133 and 177 lbf in (1.503 and 2.000 mdaN). Wire-lock the plug in accordance with 20-21-13.

(l) Test the ramp actuator brake as detailed in paragraph (4).

(4) Test Ramp Actuator Brake

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS,

AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) Depending on which actuator brake is to be tested, remove the safety clip and reset the INT 1, INT 2, INT 3 or INT 4 ST'BY HYD SUP circuit breaker (Ref. para.(1)(f)).

(c) Refer to Table 401. Using a suitable adapter, link pins a and b of the appropriate TEST connector on the interface unit.

(d) At the intake management panel, proceed as follows:-

d1) Remove the anti-interference plate from the intake management panel.

d2) Set the appropriate HYD selector switch to "YELLOW".

d3) Set the appropriate RAMP/SPILL MASTER switch to "MAN".

(e) Make available electrical ground power as detailed in 24-41-00.

WARNING: THE PERSON RESPONSIBLE FOR CONTROLLING THE TEST MUST ENSURE THAT THE PANEL IS NOT LEFT UNGUARDED UNTIL THE TEST IS CONCLUDED.

(f) Pressurize fully the standby (yellow) hydraulic system, with the application of power controlled by a responsible person associated with the test.

(g) Hold the RAMP switch at "LOWER"; check that the ramps do not move. Release the switch.

INTAKE	ZONE	INTERFACE UNIT	TEST CONNECTOR	PINS
1	4-243	No.2	1B	a and b
2	5-243	No.1	2B	a and b
3	5-244	No.4	3B	a and b
4	4-244	No.3	4B	a and b

Brake Test - Pins Location
Table 401

(h) Remove the link adapter from the TEST connector.

(i) Depressurize the hydraulic system.

(j) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(k) Trip the circuit breaker reset in operation (b) and fit a safety clip.

(5) Conclusion

<u>CAUTION:</u> AFTER REMOVAL OF TOOLS AND EQUIPMENT, THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(a) Remove all tools and equipment from the intake, and ensure that the intake interior is clean.

(b) Remove the locking pins from the hydraulic selector valves of the four intakes. Refit the access panels previously removed.

(c) At the intake management panel, proceed as follows:-

c1) Remove the anti-interference plate.

c2) Set all HYD switches to "AUTO".

c3) Leave the four RAMP/SPILL MASTER switches at the MAN position.

(d) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.(1)(f) and (3)(b)).

(e) Remove the warning placard from the engine start panel.

(f) Remove the barriers from the intake entries and from beneath the spill doors.

D. Reactivation of Ramp Actuator and Mechanism

(1) Refer to 71-00-39 and 71-00-41, Trouble Shooting; trace and rectify the fault.

4. Three Intake Ferry - Deactivation Procedure for Ferry Flight after Failure of a Hydraulic Pipe between the Air Intake and the Wing

WARNING: OBSERVE THE HYDRAULIC AND ELECTRICAL SAFETY PRECAUTIONS GIVEN IN 29-00-00 AND 24-00-00 RESPECTIVELY.

OBSERVE THE SPECIFIC WARNINGS AND CAUTIONS GIVEN IN THE PARTICULAR SERVICING AND MAINTENANCE PROCEDURES REFERRED TO.

B BRITISH AIRWAYS CONCORDE INTAKE HYDRAULIC FERRY KIT
B (DRAWING No. PM30194)

	ITEM No.	PART NO.	DESCRIPTION	QUANTITY
B	6	G906165100	Tee piece	1
B	7	G906166100	Tee piece	1
B	10	G906167100	Tee piece	1
B	11	G906172000	Sealing block assembly	1
B	14	G906163000	Pipe assembly	1
B	15	G906163001	Pipe assembly	1
B	20	G906155000	Pipe	1
B	21	G906155001	Pipe	1
B	23	G906177000	Blank, nipple	2
B	24	G906168100	Tee piece	1
B	25	G906172001	Sealing block assembly	1
B	26	G906163003	Pipe assembly	1
B	27	G906163002	Pipe assembly	1
B	29	G906160002	Pipe assembly	1
B	30	G906160000	Pipe assembly	1
B	31	G906169100	Tee piece	1
B	33	G906170100	Tee piece	1

B Above items (painted RED) are held in Transit Storage Case MPWC 6165
B Case Ser. No.01. For Concorde Ferry Flight only.

B Kit item numbers refer to item numbers in sub para. C. Equipment and
B Materials.

B NOTE: Tools, pressure blanks, pressure plugs, split pins etc.
B referred to in Maintenance Manual Chapter 71 must be called up
B separately.

A. General

Failure of certain pipes, situated between the air intake and the wing, requires intake removal to permit pipe replacement. Where aircraft are away from base, and are without the necessary equipment for intake removal, the following interim procedures deal with the isolating of specific failed pipes to enable the aircraft to be ferried back to base.

Where instructions are given in the following procedures to restrain pipe runs using ligatures, refer to 20-23-14.

Hydraulic pressure blanks comprise a cap nut and blank, secured together with a split-pin. The cap nut and blank are called up in the parts list as a single item under the heading of pressure blank; the split-pin is called up separately. In the following operations where instructed to fit a blank, a split-pin must also be fitted.

When disconnecting hydraulic pipe systems, be prepared with clean receptacles to catch residual fluid draining from the open pipe ends.

All pipes in the following procedures are to be connected and disconnected in accordance with the instructions given in 29-00-00 and/or 71-62-00, as appropriate, for the removal and installation of hydraulic pipes. When fitting special T-pieces, pressure blanks and plugs in the following procedures, torque tighten components to the values given in Table 402.

In the following procedures, if an engine is to be run to pressurize a hydraulic system, use the Dry motoring Cycle procedure in 71-00-00, Adjustment/Test. If the ground pressurizing system (hydraulic check out) is to be used, refer to 29-23-00, Servicing.

When it is required to lower the ramps, refer to 71-61-00, Adjustment/Test, Operational Test - Ramps Manual Inching.

B. Air Intake Failed Hydraulic Pipe Identification.

Pipes are code identified for expediency in text and illustrations. Pipes 1-*, 2-*, 3-* and 4-* are located in intakes 1, 2, 3 and 4 respectively (Ref. Fig.405 and 406). The procedure for each pipe code will be found under the following paragraph number:

PIPE CODE	PROCEDURE PARA.	PIPE CODE	PROCEDURE PARA.
1-1	D	3-1	P
1-2	E	3-2	Q
1-3	F	3-3	R
1-4	G	3-4	S
1-5	H	3-5	T
2-1	J	4-1	U
2-2	K	4-2	V
2-3	L	4-3	W
2-4	M	4-4	X
2-5	N	4-5	Y
2-6	O	4-6	Z

C. Equipment and Materials

ITEM NO.	DESCRIPTION	PART NO.
Intake No.1		
Pipe 1-1		
1	Blank, pressure (2)	NSA8419-12
2	Plug, pressure	NSA8408-8 or 8P
3	Split-pin (2)	MS24665-153
4	Ligature	NSA8420-2
Pipe 1-2		

R

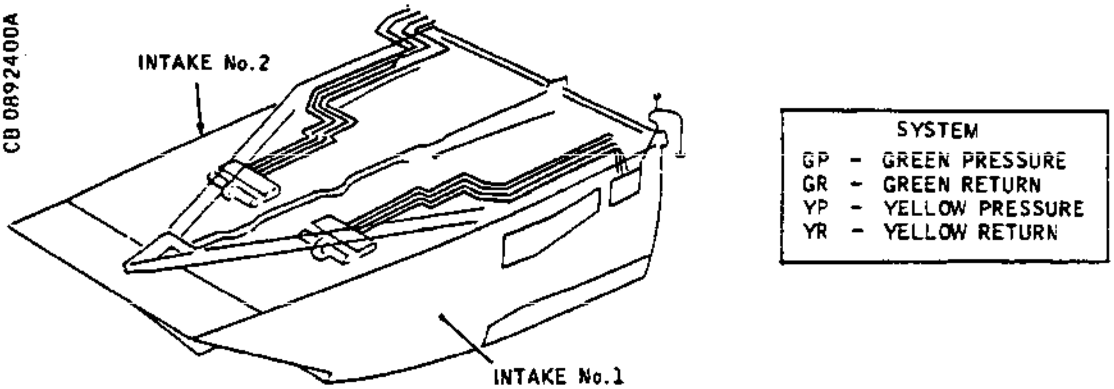
	ITEM NO.	DESCRIPTION	PART NO.
	1	Blank, pressure (2)	NSA8419-12
R	2	Plug, pressure	NSA8408-8 or 8P
	5	Blank, pressure	NSA8419-6
	6	T-piece	G906165100
	3	Split-pin (3)	MS24665-153
	4	Ligature	NSA8420-2
	Pipe 1-3		
	7	T-piece	G906166100
	Pipe 1-4		
	8	Blank, pressure	NSA8419-5
	5	Blank, pressure (2)	NSA8419-6
R	9	Plug, pressure	NSA8408-6 or 6P
	3	Split-pin (3)	MS24665-153
	4	Ligature	NSA8420-2
	Pipe 1-5		
	10	T-piece	G906167100
	8	Blank, pressure	NSA8419-5
	5	Blank, pressure	NSA8419-6
	3	Split-pin (2)	MS24665-153
	Intake No.2		
	Pipe 2-1		
	1	Blank, pressure (2)	NSA8419-12
R	32	Blank, pressure	NSA8419-8
	3	Split-pin (3)	MS24665-153
	Pipe 2-2		
	11	Sealing block assembly	G906172000
R	12	Dust cap	BAS8038.P.8BC
	13	Cable tie (3)	BAS7183-5
	14	Pipe asssembly	G906163000
	5	Blank, pressure (5)	NSA8419-6
	3	Split-pin (9)	MS24665-153
	15	Pipe assembly	G906163001
	16	Blank, pressure	NSA8419-4-1
	17	Nut	AN818-4
	18	Blank, pressure (4)	NSA8419-10
R	2	Plug, pressure	NSA8408-8 or 8P

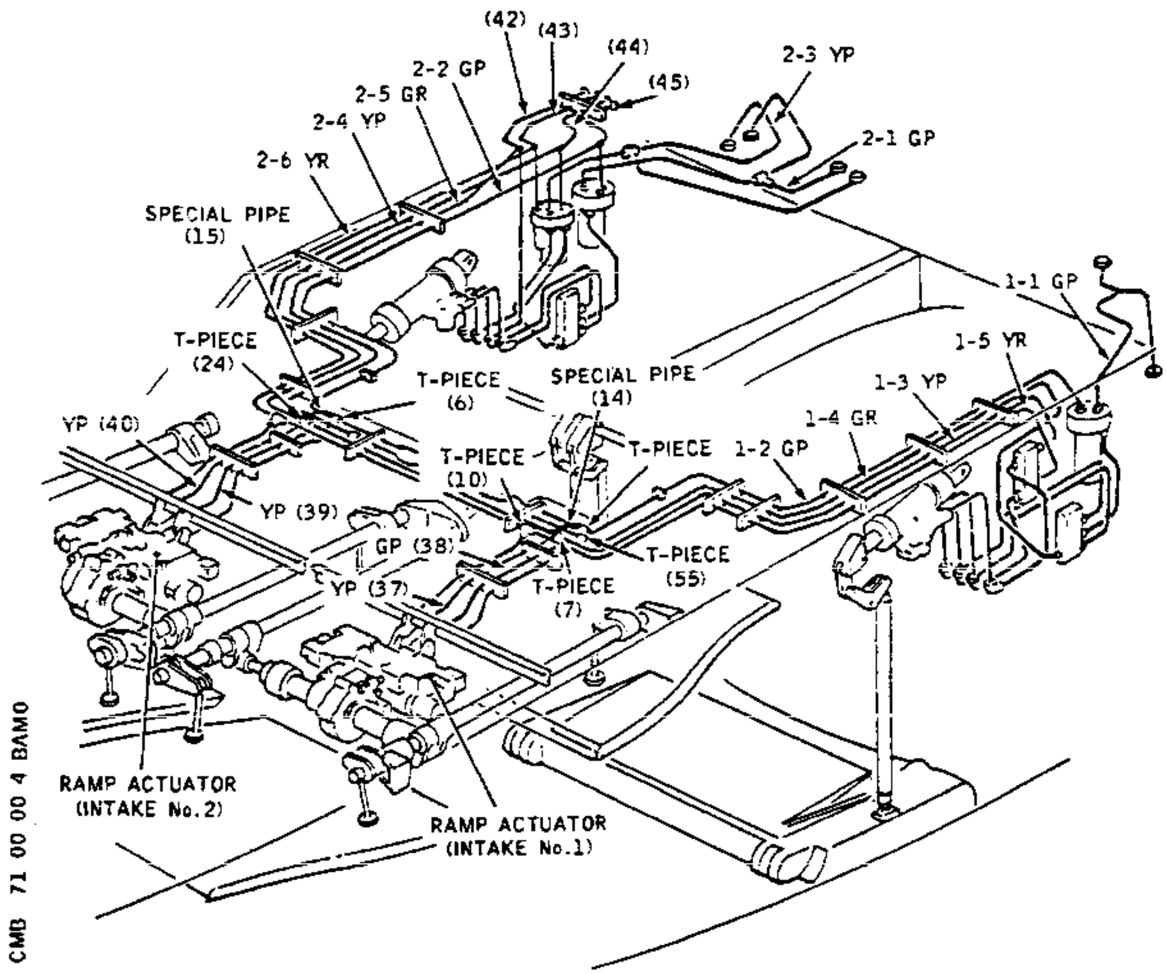
	ITEM NO.	DESCRIPTION	PART NO.
	4	Ligature	NSA8420-2
R	19	Cap, pressure	HTE8404-1J
R	9	Plug, pressure	NSA8408-6 or 6P
	20	Pipe, repair	G906155000
	21	Pipe, repair	G906155001
	22	Release tool, intake ramp, brake	E925089000
	6	T-piece	G906165100
	23	Blank, nipple (2)	G906177000
	Pipe 2-3		
	18	Blank, pressure (2)	NSA8419-10
R	9	Plug, pressure	NSA8408-6 or 6P
	4	Ligature	NSA8420-2
	3	Split-pin (2)	MS24665-153
	Pipe 2-4		
	18	Blank, pressure (2)	NSA8419-10
	23	Blank, nipple	G906177000
R	9	Plug, pressure	NSA8408-6 or 6P
	4	Ligature	NSA8420-2
	24	T-piece	G906168100
	3	Split-pin (3)	MS24665-153
	Pipe 2-5		
	23	Blank, nipple	G906177000
	3	Split-pin (8)	MS24665-153
	8	Blank, pressure (2)	NSA8419-5
	5	Blank, pressure (4)	NSA8419-6
	1	Blank, pressure (2)	NSA8419-12
	Pipe 2-6		
	23	Blank, nipple	G906177000
	25	Sealing block assembly	G906172001
	13	Cable tie	BAS7183-5
	24	T-piece	G906168100
R	12	Dust cap	BAS8038.P.8BC
	Intake No.3		
	Pipe 3-1		
	26	Pipe assembly	G906163003

ITEM NO.	DESCRIPTION	PART NO.
5	Blank, pressure (4)	NSA8419-6
3	Split-pin (9)	MS24665-153
1	Blank, pressure (3)	NSA8419-12
27	Pipe assembly	G906163002
R 2	Plug, pressure	NSA8408-8 or 8P
R 28	Plug, pressure	NSA8408-12 or 12P
4	Ligature	NSA8420-2
23	Blank, nipple (2)	G906177000
29	Repair pipe	G906160002
30	Repair pipe	G906160000
22	Release tool, intake ramp brake	E925089000
R 9	Plug, pressure	NSA8408-6 or 6P
18	Blank, pressure (2)	NSA8419-10
Pipe 3-2		
1	Blank, pressure (2)	NSA8419-12
R 2	Plug, pressure	NSA8408-8 or 8P
3	Split-pin (2)	MS24665-153
4	Ligature	NSA8420-2
Pipe 3-3		
8	Blank, pressure (2)	NSA8419-5
5	Blank, pressure (6)	NSA8419-6
3	Split-pin (8)	MS24665-153
23	Blank, nipple	G906177000
Pipe 3-4		
18	Blank, pressure (2)	NSA8419-10
3	Split-pin (2)	MS24665-153
R 9	Plug, pressure	NSA8408-6 or 6P
31	T-piece	G906169100
23	Blank, nipple	G906177000
Pipe 3-5		
23	Blank, nipple	G906177000
3	Split-pin (6)	MS24665-153
8	Blank, pressure	NSA8419-5
5	Blank, pressure	NSA8419-6
25	Sealing block assembly	G906172000
13	Cable tie	BAS7183-5
12	Dust cap	BAS8038P-8BC

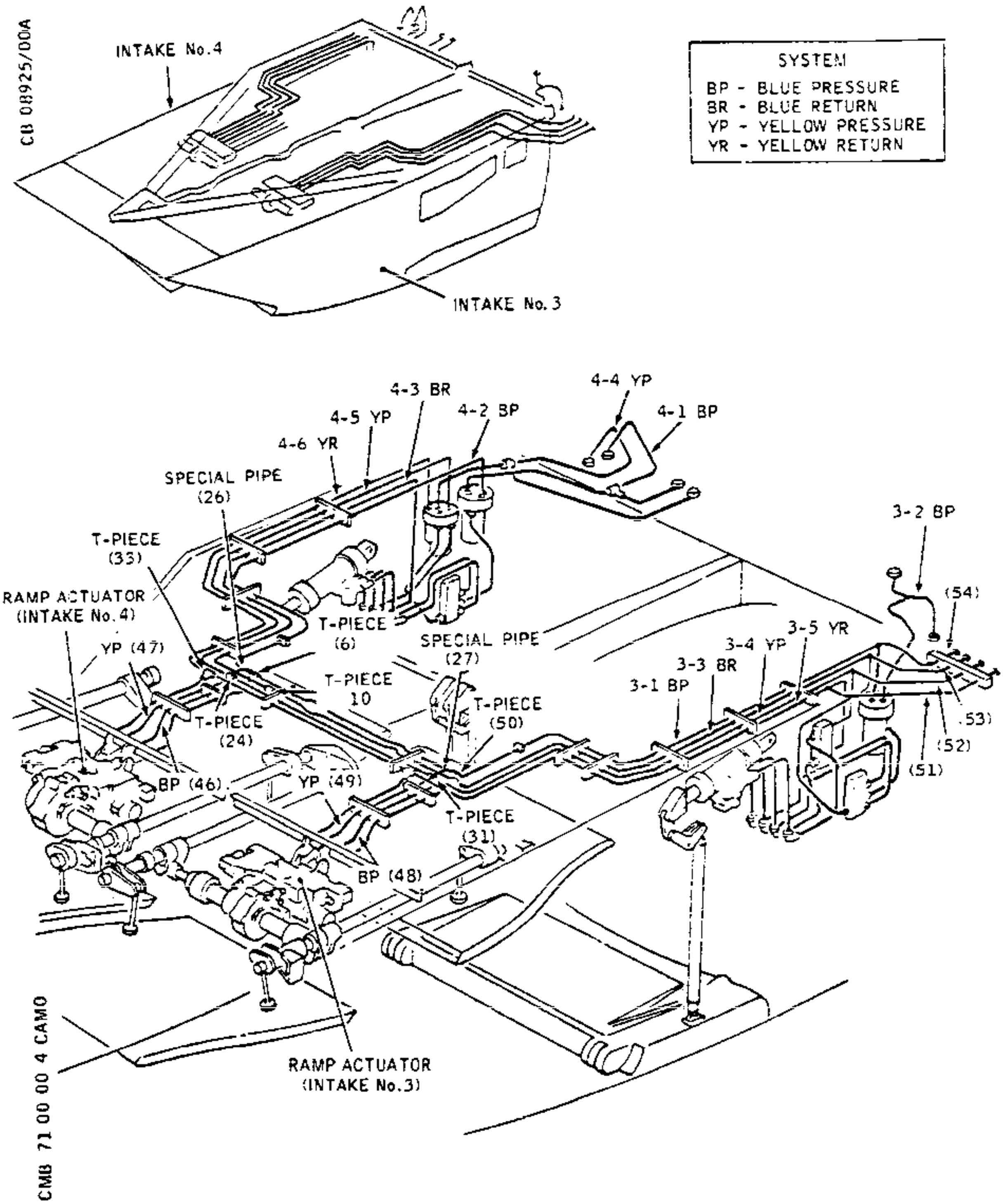
ITEM NO.	DESCRIPTION	PART NO.
	Intake No.4	
	Pipe 4-1	
1	Blank, pressure (2)	NSA8419-12
32	Blank, pressure	NSA8419-8
3	Split-pin (3)	MS24665-153
	Pipe 4-2	
1	Blank, pressure (2)	NSA8419-12
32	Blank, pressure	NSA8419-8
3	Split-pin (3)	MS24665-153
6	T-piece	G906165100
	Pipe 4-3	
8	Blank, pressure	NSA8419-5
5	Blank, pressure	NSA8419-6
3	Split-pin (2)	MS24665-153
10	T-piece	G906167100
	Pipe 4-4	
18	Blank, pressure (2)	NSA8419-10
R 9	Plug, pressure	NSA8408-6 or 6P
3	Split-pin (2)	MS24665-153
	Pipe 4-5	
18	Blank, pressure (2)	NSA8419-10
R 9	Plug, pressure	NSA8408-6 or 6P
3	Split-pin (2)	MS24665-153
24	T-piece	G906168100
	Pipe 4-6	
33	T-piece	G906170100
25	Sealing block assembly	G906172001
13	Cable tie	BAS7183-5
12	Dust cap	BAS8038P-8BC

D. Pipe 1-1. Failure of Green System Pressure Pipe (Ref. Fig. 405)





Hydraulic Pipes between Intake and Wing. Engines Nos.1 and 2
Figure 405



Hydraulic Pipes between Intake and
Wing. Engines Nos.3 and 4
Figure 406

NOTE: At the completion of this process, fluid will be prevented from flowing into the failed pipe by the non-return-valve in the HP filter. The hydraulic green pump in engine No.1 will be inoperative and all intakes will be fully operable.

(1) Isolate the hydraulic green system pump on engine No.1 (Ref. Fig. 407).

(a) Remove the green system pump drive shaft in accordance with instructions given in 29-11-71.

(b) Refit the pump, less the drive shaft, to the engine as instructed in 29-11-71. Do not proceed beyond the reconnection of hoses to the pumps in the reinstallation process. Leave the green supply hose disconnected.

(c) Remove the green pressure supply hose and fit pressure blanks, item 1, to the open ports on the pump and the connector block and plug, item 2, to the shroud drain pipe. Use ligatures to support the shroud drain pipe to the adjoining pipe.

(d) On the HYDRAULIC MANAGEMENT panel at the flight engineer's station set the GREEN PUMPS control switch to SHUT; attach a label to the switch prohibiting its use.

(2) Replenish and pressurize the hydraulic green system reservoir (Ref. 12-12-29).

(3) Pressurize the hydraulic green system by running engine No.2 (Ref. para.4A). Operate the spill door in intake No.1 and the ramps in intakes Nos.1 and 2 to bleed the circuit (Ref. 71-61-00, Adjustment/Test).

(4) Check the failed pipe for leaks by monitoring the reservoir levels.

DASH NO.	THREAD SIZE	TORQUE VALUE lbf in	mdaN
-4	7/16 - 20	95 - 115	1.08 - 1.30
-5	1/2 - 20	130 - 150	1.42 - 1.70
-6	9/16 - 18	160 - 180	1.81 - 2.20

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DASH NO.	THREAD SIZE	TORQUE VALUE lbf in	mdaN
-8	3/4 - 16	300 - 420	3.40 - 4.75
-10	7/8 - 14	400 - 560	4.50 - 6.32
-12	1.1/16 - 12	500 - 820	5.65 - 9.23

Torque Values
Table 402

E. Pipe 1-2. Failure of Green System Pressure Pipe (Ref. Fig. 405)

NOTE: At the completion of this process, Engine No.1 hydraulic green system pump will be inoperative and green supply will not be available for intake No.1

(1) Lower the ramps of intakes Nos.1 and 2 (Ref. para.4A, General).

(2) Isolate the hydraulic green system pump on engine No.1 as in para.D, operation (1).

NOTE: Ensure the green system reservoir is still depressurized.

(3) Above the rear ramp on intake No.1, remove the green pressure pipe, item 34, supplying the ramp actuator, and fit hydraulic pressure blank, item 5, to the actuator inlet.

(4) Above the rear ramp on intake No.2, remove the green pressure T-piece and replace it with special T-piece, item 6, fitted with the blank to the failed pipe.

(5) On the AIR INTAKES panel at the flight engineer's station, set the hydraulic selector switch for intake No.1 to YELLOW and attach a label prohibiting operation of the switch.

(6) On the HYDRAULIC MANAGEMENT panel, set the two yellow pumps switches to ON and attach labels prohibiting operation of the switches.

(7) Check the level of fluid in the hydraulic green system reservoir; adjust if necessary, and

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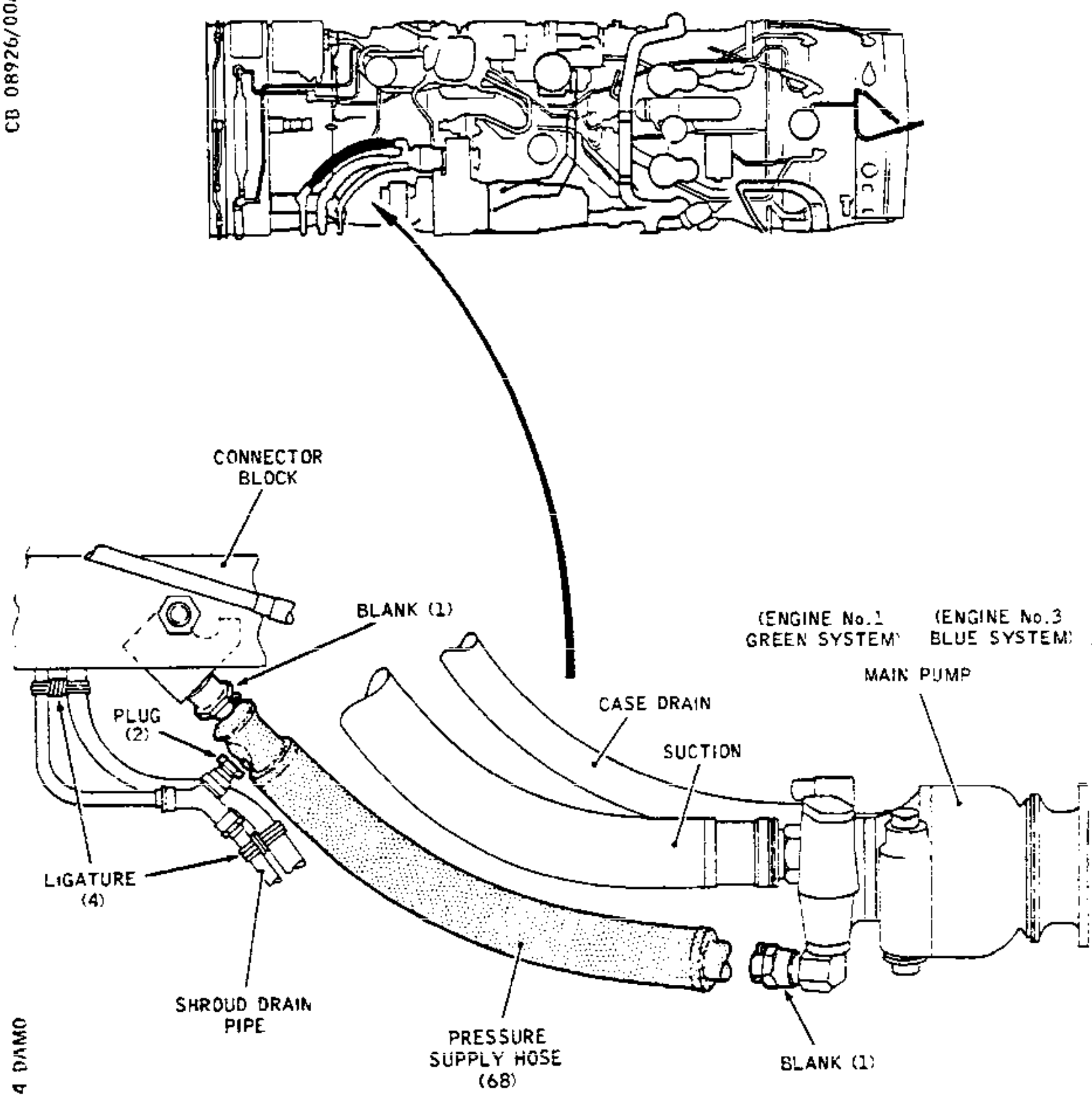

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Isolation of Green or Blue System Pump.
Engines Nos.1 and 3
Figure 407

pressurize (Ref. 12-12-29).

(8) Pressurize the hydraulic green system by running engine No.2 or by using the ground pressurizing system (Ref. para.4A).

(9) Operate the ramp in intake No.2 to bleed the circuit (Ref. 71-61-00) and check for leaks at the special T-piece and the blank above the rear ramp in intake No.1.

(10) Top-up the hydraulic green system reservoir (Ref. 12-12-29).

F. Pipe 1-3. Failure of Yellow System Pressure Pipe (Ref. Fig. 405)

NOTE: At the completion of this procedure, the hydraulic yellow system supply will not be available for intake No.1 spill door.

(1) Lower the ramps in intake No.1 (Ref. para.4A).

(2) Depressurize the hydraulic yellow system reservoir (Ref. 29-21-00, Servicing).

(3) Above the rear ramp in intake No.1 remove the yellow pressure T-piece. Connect the yellow system pressure pipe with the special T-piece, item 7, with its blanked end to the failed pipe.

(4) Check the fluid level in the hydraulic yellow system reservoir; adjust, if necessary, and pressurize (Ref. 12-12-29).

(5) Pressurize the hydraulic yellow system by running engine No.2 or 4 or by using the ground pressurizing system (Ref.para.4A). Operate the ramps in intake No.1, and the ramps and spill door in intake No.2, to bleed the system (Ref.71-61-00, Adjustment/Test). Check the T-piece, item 7, for leakage.

(6) Top-up the hydraulic yellow system reservoir (Ref. 12-12-29).

(7) On the AIR INTAKES panel at the flight engineer's station set the hydraulic selector switch for intake No.1 to GREEN and attach a label prohibiting operation of the switch.

G. Pipe 1-4. Failure of Green System Return Pipe

(Ref. Fig. 405)

NOTE: At the completion of this procedure, intake No.1 spill door will not be supplied by the hydraulic green system. Leakage of fluid into the failed pipe will be limited to the fluid which transfers from the yellow system across the spool of the changeover valve of intake No.1 spill door actuator. This is specified as 9 cc/minute maximum at 125 deg C and 150 psi differential pressure but will be much less than this in practice.

(1) Lower the forward and rear ramps in engine intake No.1.

(2) Depressurize the hydraulic green system reservoir (Ref. 29-11-00, Servicing).

(3) In the filter bay at the side of intake No.1, remove the green pressure pipe supplying the spill door selector; fit blanks to the filter head and selector manifold (Ref. Fig. 408).

(4) Above the rear ramp on intake No.1:

(a) Disconnect the failed pipe from the T-piece, item 35, and release the pipe from the clamp.

(b) Fit a pressure blank, item 5, to the T-piece.

(c) Fit a plug, item 9, to the failed pipe.

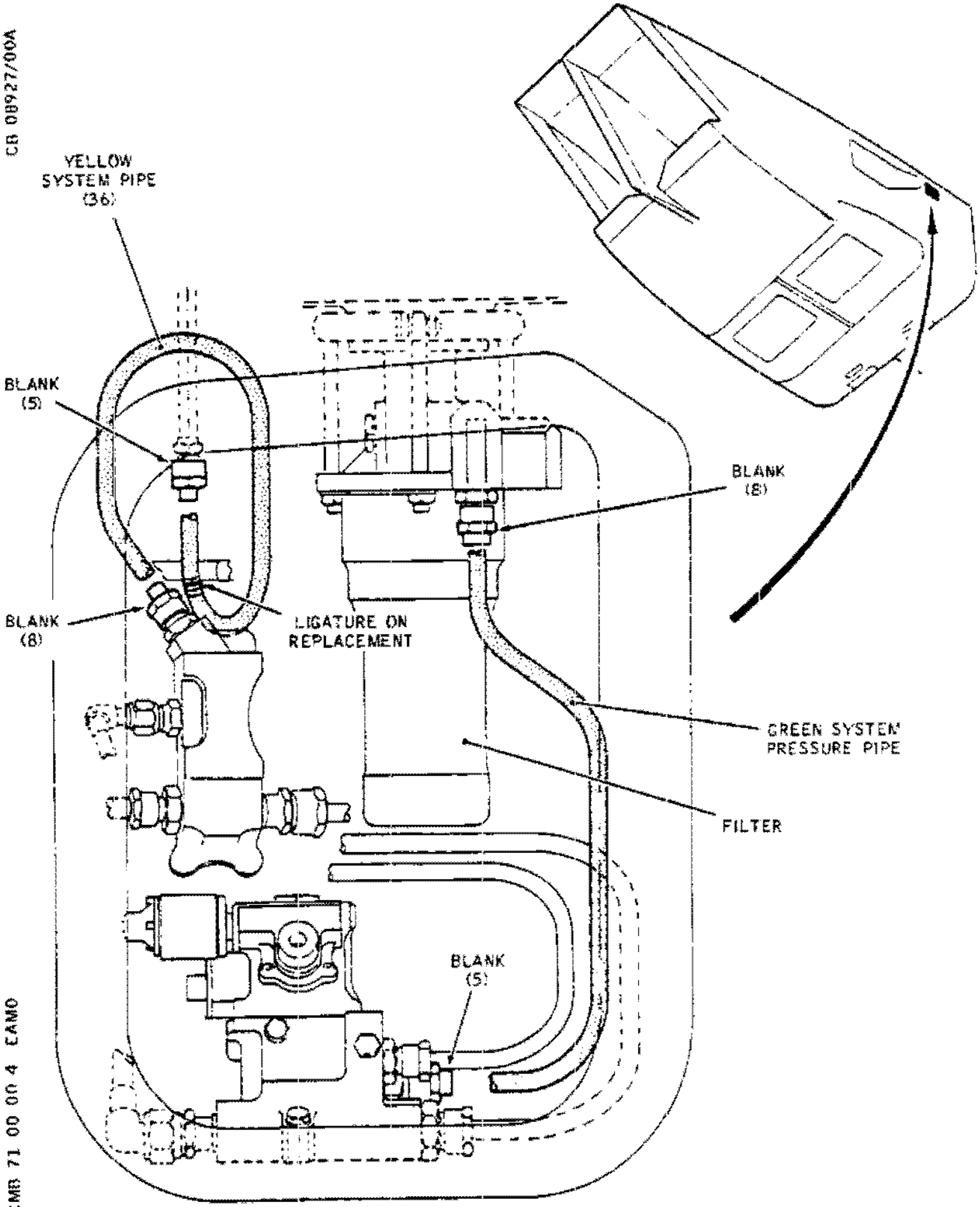
(d) Resecure the failed pipe in the clamp and secure the plug and blank together with a ligature.

(5) Replenish and pressurize the hydraulic green system reservoir (Ref. 12-12-29).

(6) Pressurize the green hydraulic system by running engine No.1 or 2 or by using the ground pressurizing system (Ref. para.4A).

(7) Operate the ramps of intakes No.1 and 2 to bleed the circuit. Check for leaks at the blanks in the filter bay and above the rear ramp. Re-check and, if necessary, top-up, the level in the hydraulic reservoir.

(8) On the AIR INTAKES panel, set the hydraulic selector



Filter Bay, Intake No.1
Figure 408

switch for intake No.1 to YELLOW and attach a label to the switch prohibiting its use.

(9) On the HYDRAULIC MANAGEMENT panel, set the two yellow system pumps switches to ON and attach labels to them prohibiting their use.

H. Pipe 1-5. Failure of Yellow System Return Pipe (Ref. Fig. 405)

NOTE: At the completion of this procedure, intake No.1 spill door will not be supplied by the hydraulic yellow system. Leakage of fluid into the failed pipe will be limited to the fluid which transfers from the green system across the spool of the changeover valve of intake No.1 spill door actuator.

(1) Lower the ramps in intake No.1 (Ref.para.4A).

(2) Depressurize the hydraulic yellow system reservoir (Ref. 29-21-00, Servicing).

(3) Above the rear ramp in intake No.1, remove the yellow return T-piece and replace it with special T-piece, item 10, with the blanked end fitted to the failed pipe.

(4) In the hydraulic filter bay in the side of intake No.1, remove the ligature securing the yellow system pressure pipe, item 36, supplying the spill door selector, then remove the pipe. Fit a pressure blank, item 8, on the selector valve and a pressure blank, item 5, to the open supply pipe (Ref. Fig. 408).

(5) Replenish and pressurize the hydraulic yellow reservoir (Ref. 12-12-29).

(6) Pressurize the hydraulic yellow system by running engine 2 or 4 or by using the ground pressurizing system (Ref. para.4A). Operate the ramps in intakes Nos.1 and 2 using the yellow system, to bleed the circuit (Ref. 71-61-00, Adjustment/Test).

(7) Check for leaks at the T-piece, item 10, above ramp 1, and at the pressure inlet blank, item 5, in the filter bay.

(8) Check and top-up the hydraulic reservoirs (Ref. 12-12-29).

(9) On the AIR INTAKES control panel set the hydraulic selector switch for intake No.1 to GREEN and attach a label prohibiting its operation.

J. Pipe 2-1. Failure of Green System Pressure Pipe (Ref. Fig. 405)

NOTE: At the completion of this procedure, the non-return valve in the filter head prevents loss of fluid into the failed pipe.
Engine No.2 hydraulic green system pump is inoperative.
All intakes are fully operative.

(1) Depressurize the hydraulic green system reservoir (Ref. 29-11-00, Servicing).

(2) Isolate the hydraulic green system pump on engine No.2 (Ref. Fig. 409):

(a) Remove the green system pump drive shaft in accordance with the instructions given in 29-11-71.

(b) Refit the pump, less the drive shaft, to the engine, as instructed in 29-11-71. Do not proceed beyond the reconnection of hoses to the pumps in the reinstallation process. Leave the green supply hose disconnected.

(c) Remove the green pressure supply hose with rigid pipe, and fit pressure blanks, item 1, to the open ports of the pump and connector block, and blank, item 2 at the rigid pipe disconnection.

(d) On the HYDRAULIC MANAGEMENT panel set the pump selector switch to SHUT and attach a label prohibiting use of the switch.

(3) Replenish and pressurize the hydraulic green reservoir (Ref. 12-12-29).

(4) Pressurize the green system by running engine No.1 (Ref. para.4A), and check the failed pipe for leaks by monitoring the hydraulic tank fluid level.

(5) Check the fluid level in the hydraulic system green reservoir and, if necessary, adjust.

K. Pipe 2-2. Failure of Green System Pressure Pipe

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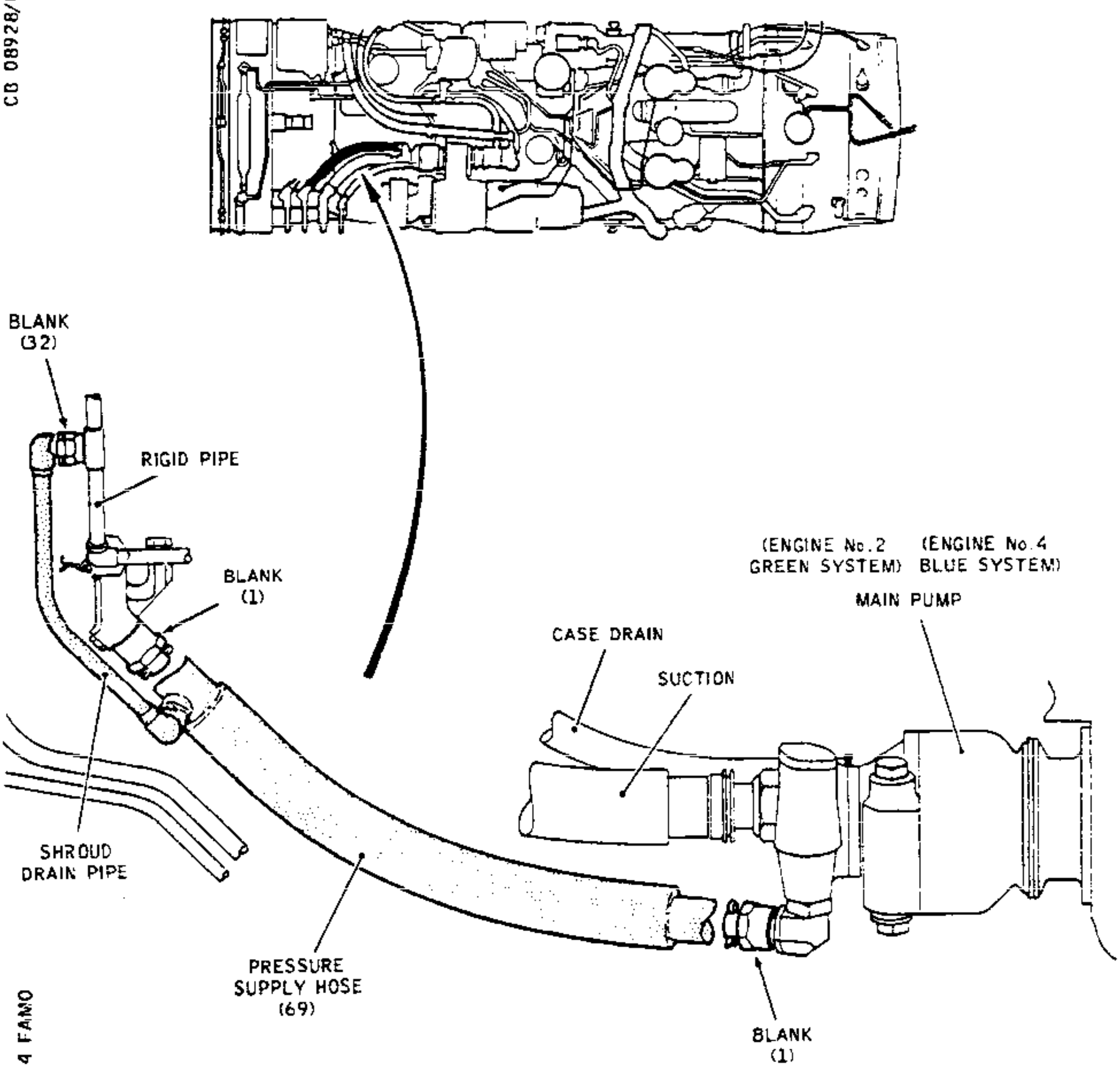

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Isolation of Green or Blue System
Pump. Engines Nos.2 and 4
Figure 409

(Ref. Fig. 405)

NOTE: At the completion of this procedure to isolate the failed pipe:

(a) The ramps of engines Nos.1 and 2 will be fixed (held by their brakes).
(b) The spill doors will be held by green system pressure. In the event of failure of green system pressure, the spill doors may open under aerodynamic load.
(c) Engine No.2 hydraulic yellow system pump will be inoperative.
(d) Engine No.2 hydraulic green system pump low pressure switch will be inoperative.

(1) Lower the ramps of intakes Nos.1 and 2.

(2) Depressurize the hydraulic green and yellow systems reservoirs (Ref. 29-11-00, 29-21-00, Servicing).

(3) In the filter bay at the side of intake No.2, replace the hydraulic green system spill door selector valve with the sealing block assembly (Ref. Fig. 410).

(a) Remove the valve in accordance with 71-62-12.

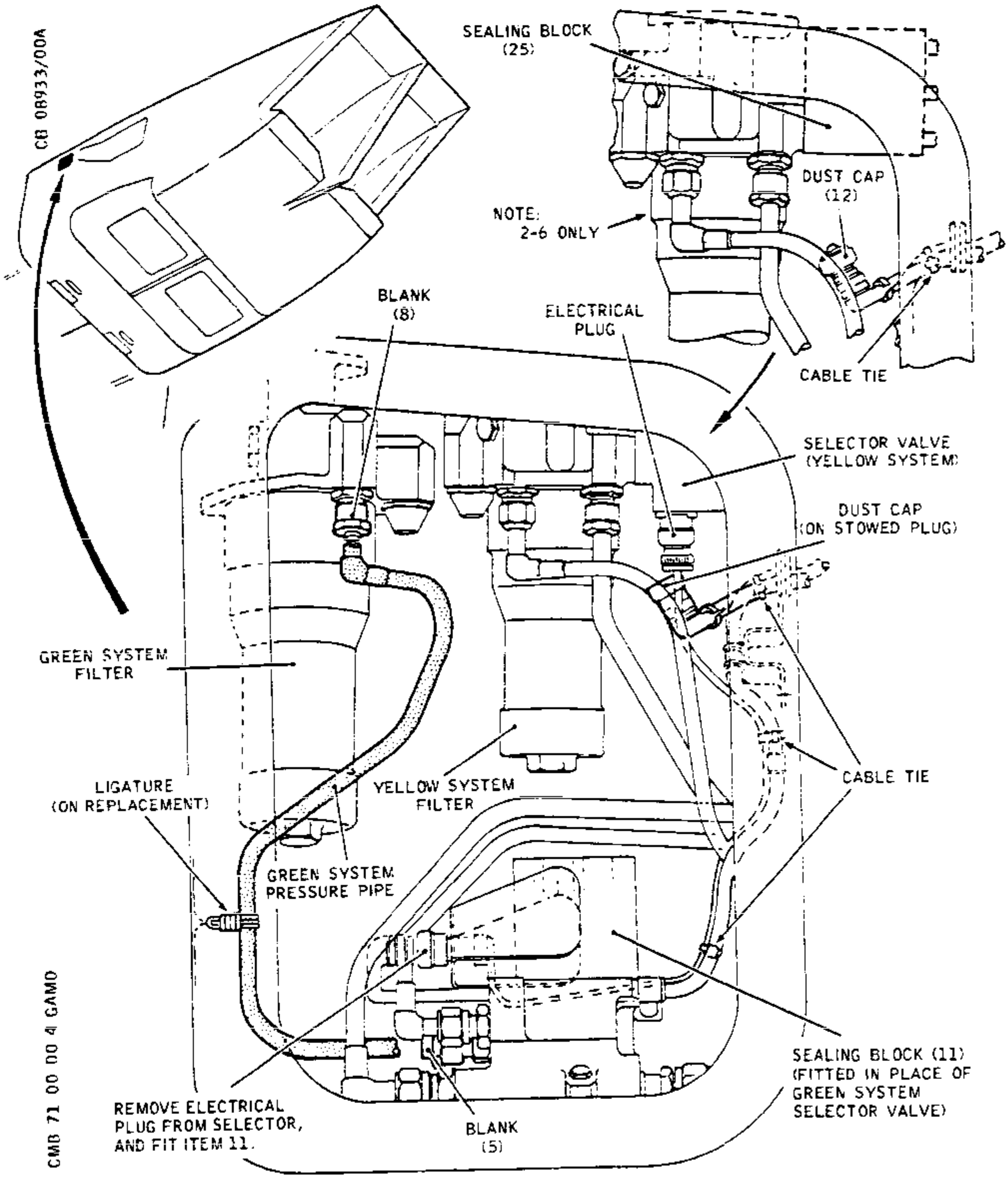
(b) Fit the sealing block assembly, item 11, in place of the valve, fitting the spools in accordance with 20-22-16. Secure the block with the existing washers and bolts; torque tighten the bolt to between 50 and 60 lbf in (0.565 and 0.678 mdaN). Lock the bolts with wire (Ref. 20-21-13).

(c) Connect the electrical plug removed from the selector valve to the sealing block socket.

(d) Disconnect the electrical plug from the spill door yellow system selector valve, fit a dust cap, item 12, and stow the plug using a cable tie, item 13. Remove the cap chain.

(e) Connect the electrical plug on the sealing block lead into the socket on the yellow system selector valve. Secure the lead with two cable ties.

(4) Above the rear ramp in intake No.1:



Filter Bay, Intake No.2
Figure 410

(a) Remove the yellow and green pressure supply pipes, items 37 and 38, connected to the ramp actuator.

(b) Fit pressure blanks, item 5, to the open inlet ports on the ramp actuator.

(c) Connect the green and the yellow pressure supply pipes together at the T-pieces, using special pipe assembly, item 14. Torque tighten the pipe nuts to between 400 and 500 lbf in (4.52 and 6.33 mdaN).

(5) Above the rear ramp in intake No.2:

(a) Remove the green and the yellow system pressure supply pipes, items 39 and 40, connected to the ramp actuator.

(b) Fit pressure blanks, item 5, to the open inlets on the ramp actuator.

(c) Remove the green pressure T-piece and in its place fit the special T-piece, item 6, with the blank to the failed pipe.

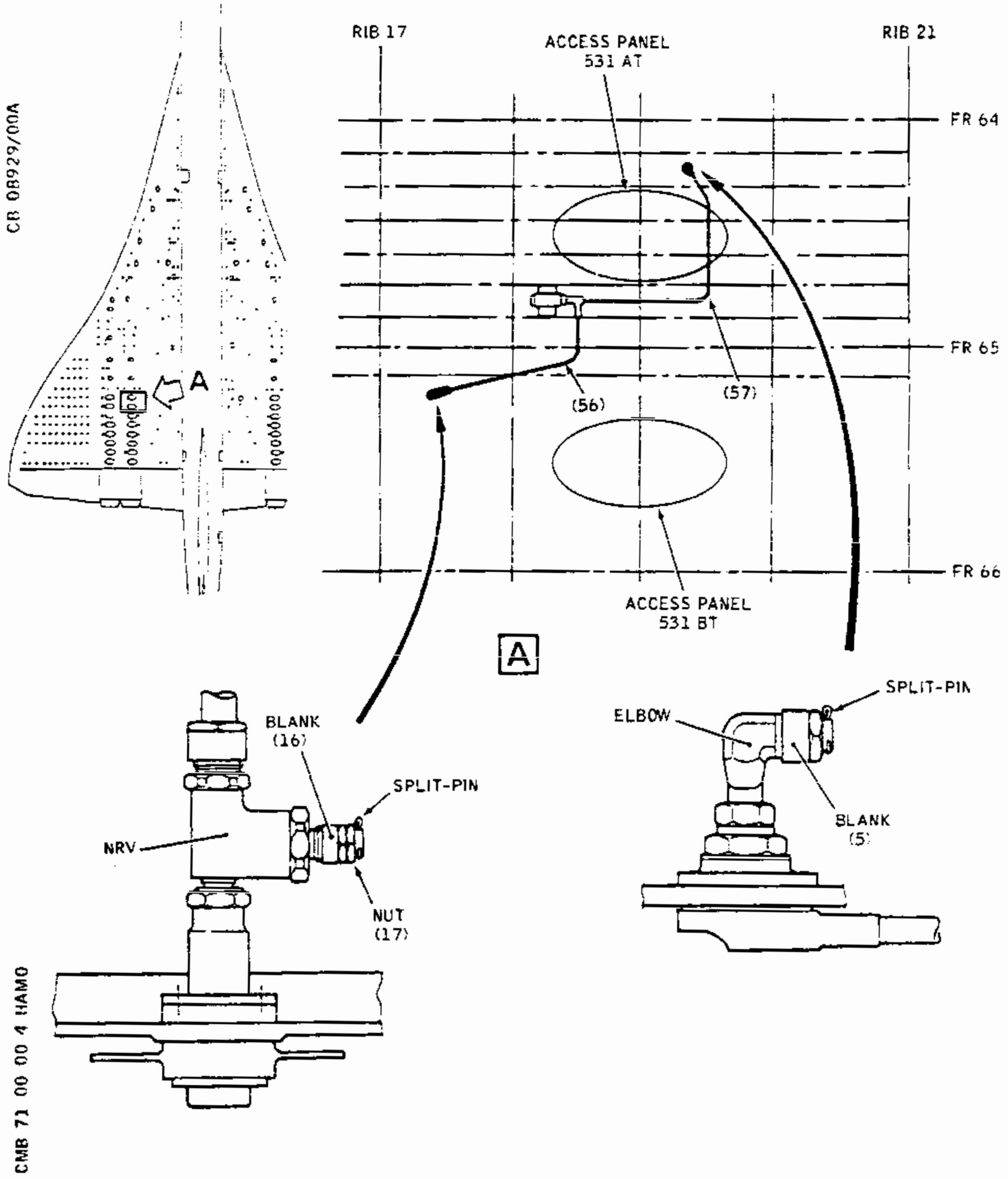
(d) Connect the green and the yellow system pressure supply pipes together at the T-pieces using special pipe assembly, item 14. Torque tighten the pipe nuts to between 400 and 500 lbf in (4.52 and 6.33 mdaN).

(6) Remove access panels 531AT and BT to gain access in the dry bay above engine No.2 and remove pipes item 40 and 41, (Ref. Fig. 411). Fit a blank, item 5, to the elbow and a blank, item 16, nut item 17, and split-pin to the non-return valve.

(7) In engine bay No.2 (Ref. Fig. 412).

(a) Disconnect the yellow system supply hose at the self-sealing coupling, the supply pipe and shroud drain. Fit pressure blank, item 18, to the yellow supply pipe and pressure plug, item 2, to the shroud drain pipe. Secure the drain pipe with a ligature.

(b) Disconnect the green system supply hose at the self-sealing coupling and connect it to the yellow self-sealing coupling.



Pipe Disconnections in Dry Bay (Pipe 2-2)
Figure 411

(c) Slacken the nut on the coupling elbow to permit correct alignment of the hose. Retighten the nut to a torque value of between 500 and 825 lbf in (5.60 and 9.25 mdaN).

(d) Fit the pressure cap, item 19, to the green coupling.

(8) Isolate the yellow system pump on Engine No.2 (Ref. Fig. 413).

(a) Remove the yellow system pump drive shaft in accordance with 29-21-71.

(b) Refit the pump, less the drive shaft, to the engine as instructed in 29-21-71. Do not proceed beyond the reconnection of hoses to the pump in the re-installation process. Leave the yellow supply hose disconnected.

(c) Remove the yellow supply hose and fit pressure blanks, item 18, to the pump and connector block; fit a pressure plug, item 9, to the shroud drain pipe. Secure the shroud drain pipe with a ligature.

(d) On the HYDRAULIC MANAGEMENT panel set the pump selector switch to SHUT and attach a label prohibiting use of the switch.

(9) In the underwing fillet at the side of engine nacelle No.2 remove the green return, yellow return and yellow pressure pipes, and green pressure elbow assembly, items 42, 43, 44 and 45. In their place fit repair pipes, items 20 and 21, and hydraulic nipple blanks, item 23, (Ref. Fig. 414).

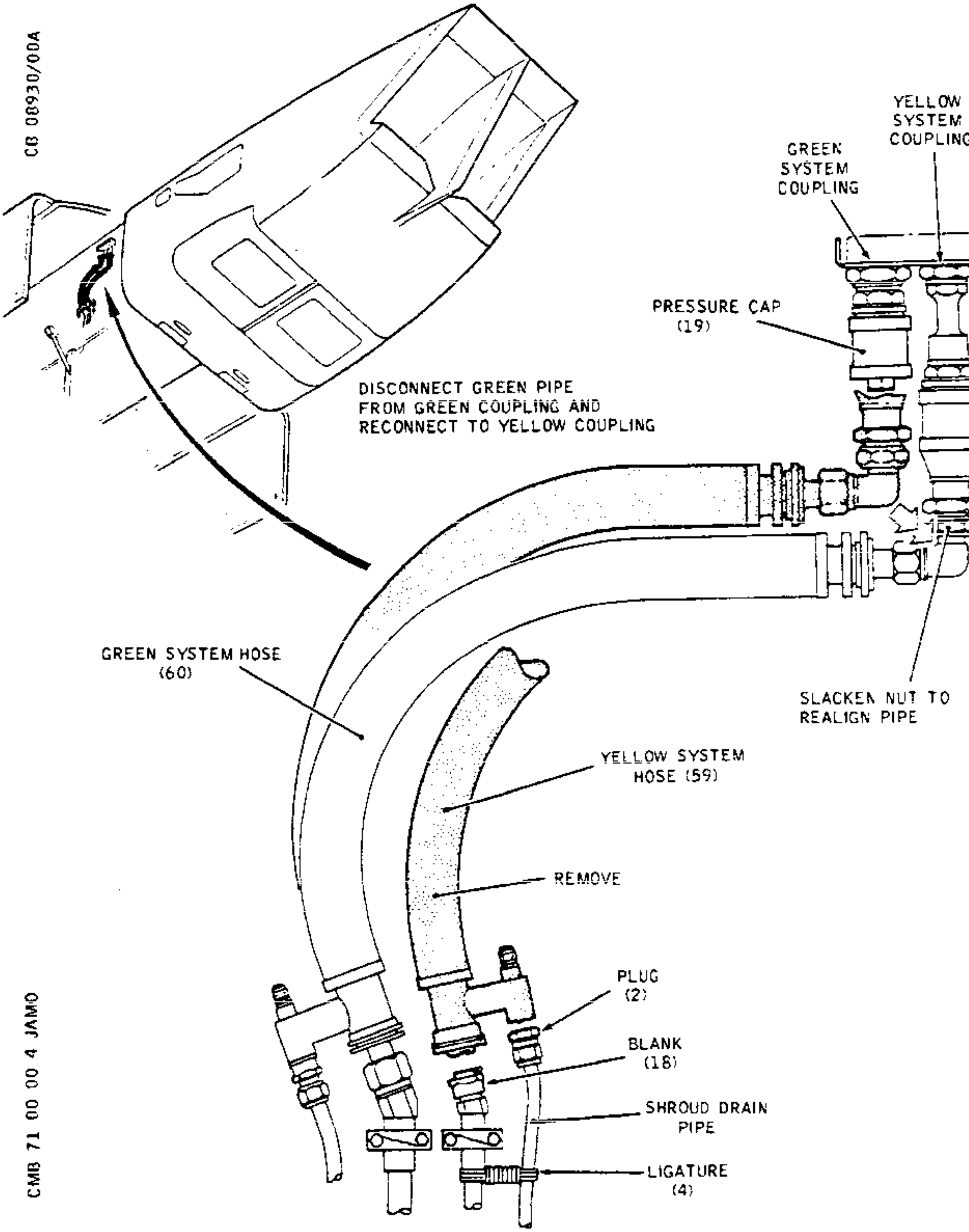
(10) Adjust the fluid levels and pressurize the green and the yellow reservoirs (Ref. 12-12-29).

(11) Pressurize the hydraulic green system by running engine No.2 and check for leaks at the:

(a) Special pipes above the rear ramps in intakes Nos.1 and 2.

(b) Special T-piece above the rear ramp in intake No.2.

(c) Self-sealing coupling in engine bay No.2.



Hydraulic Pipe Changeover. Engine No.2 (Pipe 2-2)
Figure 412

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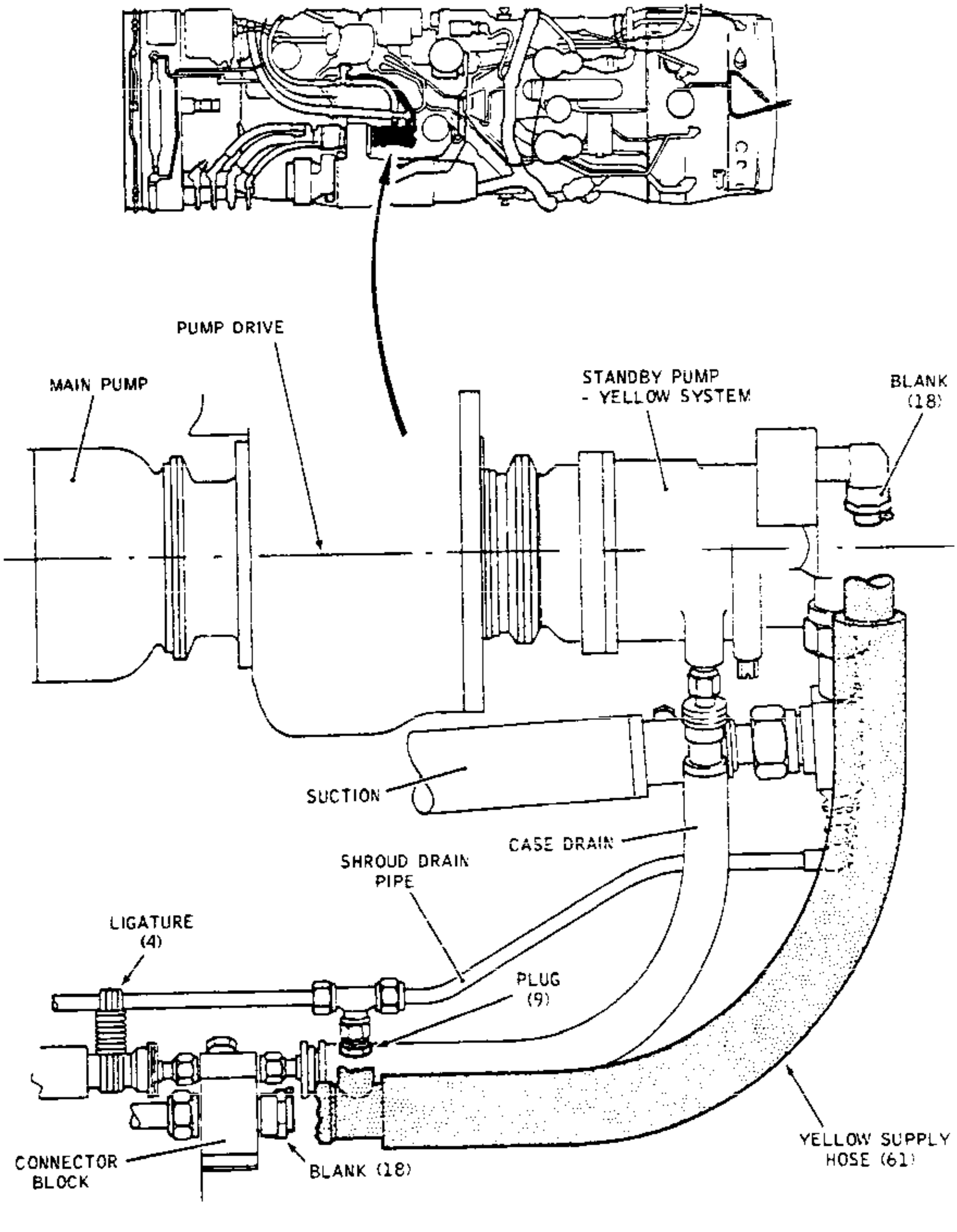

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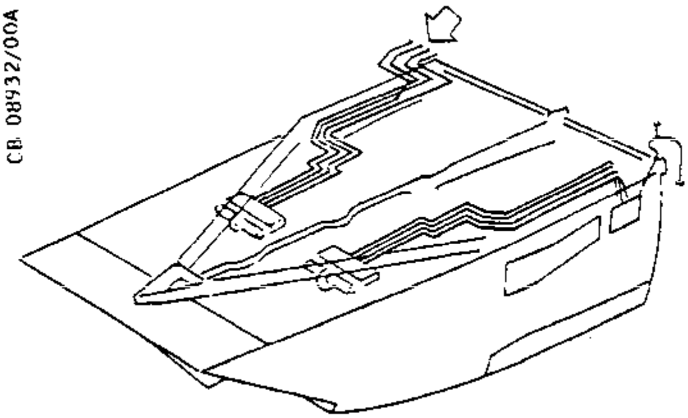
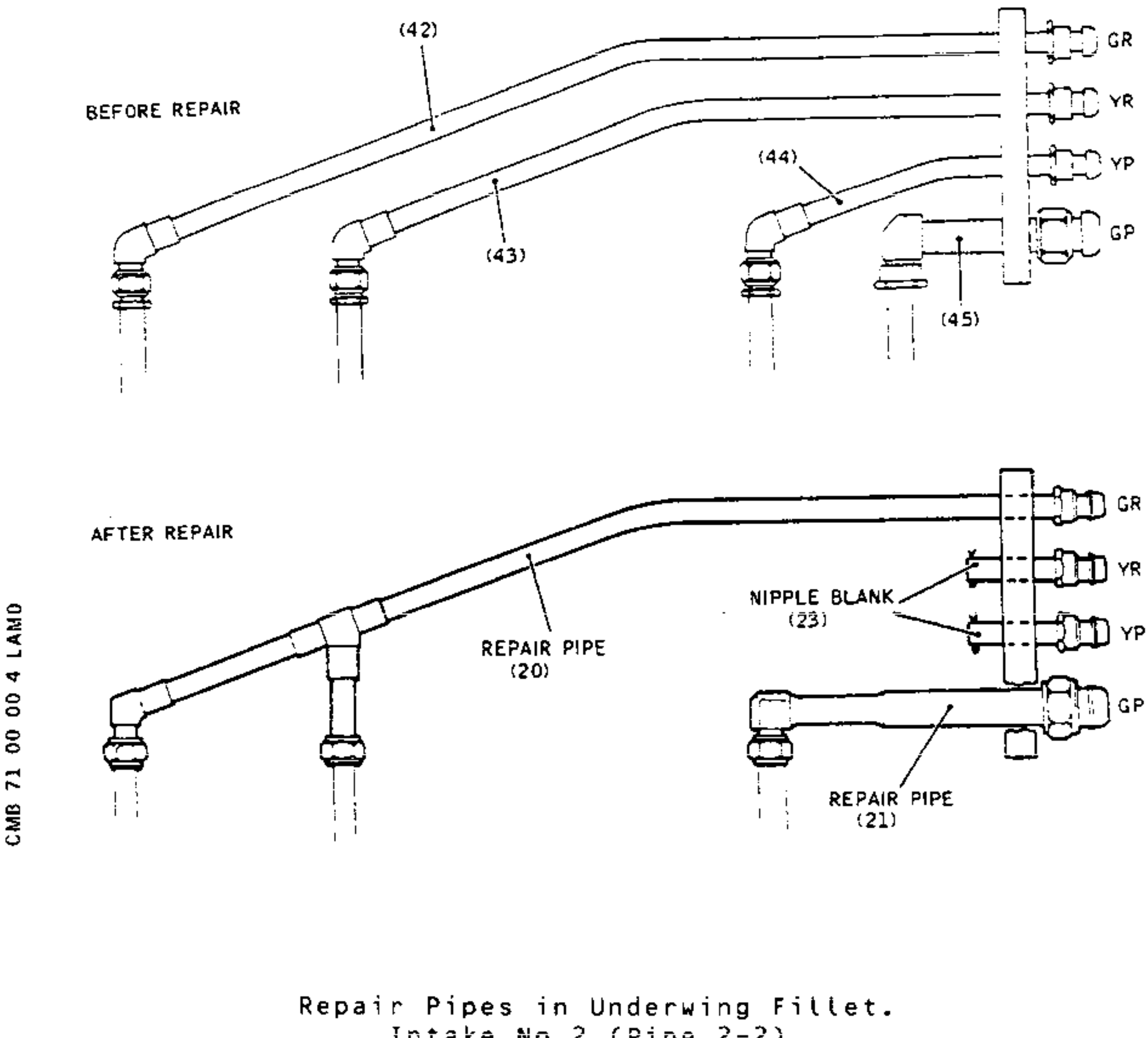
Isolation of Yellow System Pump Engine 2 or 4
Figure 413





Repair Pipes in Underwing Fillet.
Intake No.2 (Pipe 2-2)
Figure 414

(d) Pipes in the underwing fillet.

(e) Sealing block in the filter bay of engine No.2.

(f) Blanks in the dry bay.

(12) Pressurize the hydraulic yellow system by running engine No.4 or by using the ground pressurizing system (hydraulic check-out, Ref.para.4A), and check for leaks in the underwing fillet.

(13) Raise the ramps of intakes Nos.1 and 2 by disengaging the brake using the brake release tool, item 22, as detailed on the attached label, and manually turning the screwjack. When fully raised, re-apply the brake.

(14) Top-up the hydraulic green and yellow systems reservoirs (Ref. 12-12-29).

(15) On the AIR INTAKES panel set the hydraulic selector switches for intakes Nos.1 and 2 to GREEN and attach a label to the switch prohibiting use of the switch.

(16) On the HYDRAULIC MANAGEMENT panel attach a label to the engine No.2 green pump low pressure light stating that it is inoperative.

L. Pipe 2-3. Failure of Yellow System Pressure Pipe (Ref. Fig. 405)

NOTE: At the completion of this procedure, the non-return valve in the filter head prevents loss of fluid into the failed pipe.

Engine No.2 hydraulic yellow system pump will be inoperative. All intakes will be fully operative.

(1) Depressurize the hydraulic yellow system reservoir (Ref. 29-21-00, Servicing).

(2) Isolate the yellow system pump on engine No.2 as detailed in para.J, operation (8).

(3) Replenish and pressurize the yellow system reservoir (Ref. 12-12-29).

(4) Pressurize the hydraulic system by running engine No.4 (Ref. para.4A) and check the failed pipe for leakage by monitoring the tank levels.

(5) Top-up the hydraulic reservoirs.

M. Pipe 2-4. Failure of Yellow System Pressure Pipe (Ref. Fig. 405)

NOTE: At the completion of this procedure to isolate the failed pipe the engine No.2 hydraulic yellow pump is inoperative and intakes Nos.1 and 2 are not supplied by the yellow system.

(1) Lower the ramps of intake No.2.

(2) Depressurize the hydraulic yellow system reservoir (Ref. 29-21-00, Servicing).

(3) Isolate the yellow system pump on engine No.2 as detailed in para.J, operation (8).

(4) Above rear ramp in intake No.2, remove the yellow pressure T-piece and replace it by special T-piece, item 24, with the blank side to the failed pipe.

(5) In the underwing fillet at the side of nacelle No.2, remove the yellow pressure pipe, and fit nipple blank, item 23, to the yellow pressure pipe on the aircraft system.

(6) Replenish and pressurize the hydraulic yellow system reservoir (Ref. 12-12-29).

(7) Pressurize the hydraulic yellow system by running engine No.4 or by using the ground pressurizing system (Ref. para.4A), and check for leaks in the underwing fillet.

(8) Top-up the hydraulic reservoirs (Ref. 12-12-29).

(9) On the AIR INTAKES panel set the hydraulic selector switches for intakes Nos.1 and 2 to GREEN and attach a label prohibiting their operation.

N. Pipe 2-5. Failure of Green System Return Pipe (Ref. Fig. 405)

NOTE: At the completion of this procedure:

(a) Intakes Nos.1 and 2 are not supplied by the green hydraulic system.

(b) Fluid leaking into the failed pipe is limited to that which transfers from the yellow

system across the spool of the changeover valves of the spill door actuators of intakes Nos.1 and 2.

(1) Lower the ramps of intakes Nos.1 and 2.

(2) Depressurize the hydraulic green system reservoir (Ref. 29-11-00, Servicing).

(3) In the underwing fillet at the side of nacelle No.2, remove the hydraulic green system return pipe, item 42. Fit a nipple blank, item 23, to the green return pipe on the aircraft system side.

(4) In the filter bay at the side of intake No.1, remove the green pressure pipe supplying the spill door selector and fit blanks, item 8 and 5, to the filter head and selector manifold (Ref. Fig. 408).

(5) In the filter bay at the side of intake No.2, remove the green pressure pipe supplying the spill door selector and fit blanks, item 8 and 5, to the filter head and selector manifold (Ref. Fig. 410).

(6) Above the rear ramp in intake No.1, remove the green pressure pipe, item 38, supplying the ramp actuator. Fit blank, item 5, to the open port at the ramp actuator, and a blank, item 1, at the T-piece.

(7) Above the rear ramp in intake No.2, remove the green pressure pipe, item 39, supplying the ramp actuator. Fit a blank, item 5, to the open port at the ramp actuator and a blank, item 1 at the T-piece.

(8) Replenish and pressurize the hydraulic green system reservoir (Ref. 12-12-29).

(9) Pressurize the hydraulic green system, by running engine No.1 (Ref. para.4A), to bleed the green pressure pipes.

(10) Check all blanks for leaks at:

(a) Filter bays in intakes Nos.1 and 2.

(b) Rear ramps in intakes Nos.1 and 2.

(c) Underwing fillet of nacelle No.2.

(11) Top-up the green system reservoir (Ref. 12-12-29).

(12) On the AIR INTAKES panel, set the hydraulic selectors for intakes Nos.1 and 2 to YELLOW and attach a label prohibiting use of the switch.

(13) On the HYDRAULIC MANAGEMENT panel set the two yellow pump selectors to ON and attach a label prohibiting use of the switch.

O. Pipe 2-6. Failure of Yellow System Pipe (Ref. Fig. 405)

NOTE: At the completion of this procedure:

(a) Intakes Nos.1 and 2 are not supplied by the yellow hydraulic system.

(b) Leakage of fluid into the failed pipe is limited to that which transfers from the green system across the spool of the changeover valves of the spill door jacks of intakes Nos.1 and 2.

(1) Lower the ramps of intake No.2 (Ref.para.4A).

(2) Depressurize the hydraulic yellow system reservoir (Ref. 29-21-00, Servicing).

(3) In the underwing fillet on the side of nacelle No.2 remove the yellow system return pipe, item 43. Fit nipple blank, item 23, to the aircraft system yellow return pipe.

(4) In the filter bay in the side of intake No.2, replace the hydraulic yellow system spill door selector valve with the sealing block assembly (Ref. Fig. 410):

(a) Remove the yellow system filter with selector valve in accordance with 29-11-73.

(b) Remove the selector valve from the filter and in its place fit the sealing block assembly, item 25, fitting the spools as instructed in 20-22-16, using the existing washers and bolts. Torque tighten the bolts to between 50 and 60 lbf in (0.565 and 0.678 mdaN) and lock them with wire (Ref. 20-21-13).

(c) Remove the chain from the dust cap, item 12, and fit the cap to the disconnected electrical supply plug; stow the plug using a cable tie.

(d) Refit the filter to the intake as instructed in 29-11-73.

(5) Above the rear ramp in intake No.2 remove the yellow pressure T-piece and replace it with special T-piece, item 24, with the blanked end fitted towards the failed pipe.

(6) Replenish and pressurize the hydraulic yellow system reservoir (Ref. 12-12-29).

(7) Pressurize the hydraulic yellow system by running engine No.2 or 4 or by using the ground pressurizing system (Ref. para.4A), and check for leaks in the filter bay, at the T-piece above the rear ramp in intake No.2 and at the blank in the underwing fillet.

(8) Top-up the hydraulic yellow system reservoir (Ref. 12-12-29).

(9) On the AIR INTAKES panel, set the hydraulic selector switch for intakes Nos.1 and 2 to GREEN and attach a label prohibiting use of the switch.

P. Pipe 3-1. Failure of Blue System Pressure Pipe (Ref. Fig. 406)

NOTE: At the completion of this procedure to isolate the failed pipe, the ramps of engines Nos.3 and 4 will be fixed (held by their brakes).
The spill doors will be held by blue system pressure. In the event of failure of blue system pressure the spill doors may open under aero-dynamic load.
Engine No.3 hydraulic blue system pump will be inoperative.
Engine No.4 hydraulic yellow system pump will be inoperative.

(1) Lower the ramps of intakes Nos.3 and 4.

(2) Above the rear ramp in intake No.4:

(a) Remove the hydraulic blue and yellow systems ramp actuator supply pipes, items 46 and 47.

(b) Connect the blue and the yellow systems pressure pipes together at the T-pieces using pipe assembly item 26. Torque tighten the pipe nuts to between 400 and 560 lbf in (4.52 and

6.33 mdaN).

(c) Fit blanks, item 5, to the inlets on the ramp actuator.

(3) Above rear ramp in intake No.3:

(a) Disconnect the failed pipe from the T-piece, item 50.

(b) Release the pipe from the pipe clamp.

(c) Fit a pressure blank, item 1, to the T-piece.

(d) Fit plug, item 28, to the end of the pipe.

(e) Secure the blank to the plug using a ligature.

(f) Remove the blue and the yellow systems ramp actuator supply pipes, items 48 and 49.

(g) Connect the blue and the yellow systems pressure pipes together at the T-pieces using item 27. Torque tighten the pipe nuts to between 400 and 560 lbf in (4.52 and 6.33 mdaN).

(h) Fit blanks, item 5, to the inlets on the ramp actuator.

(4) Isolate the yellow hydraulic system pump on engine No.4 (Ref. Fig. 413):

(a) Remove the yellow system pump drive shaft in accordance with 29-21-71.

(b) Refit the pump, less the drive shaft, to the engine as instructed in 29-21-71. Do not proceed beyond reconnection of the hoses to the pump in the re-installation process. Leave the yellow supply hose disconnected.

(c) Remove the yellow supply hose and fit pressure blanks, item 18, to the pump and connector block, and fit a pressure plug, item 9, to the shroud drain pipe. Secure the shroud drain pipe with a ligature.

(d) On the HYDRAULIC MANAGEMENT panel, set the pump selector switch to SHUT and attach a label prohibiting use of the switch.

(5) Isolate the hydraulic blue system pump on engine No.3 (Ref. Fig. 407):

(a) Remove the blue system pump drive shaft in accordance with 29-12-71.

(b) Refit the pump, less the drive shaft, to the engine as instructed in 29-12-71. Do not proceed beyond the reconnection of hoses to the pump in the re-installation process. Leave the blue pressure hose disconnected.

(c) Remove the pump pressure hose and fit pressure blanks, item 1, to the pump and connector block connections. Fit a pressure plug, item 2, to the shroud drain pipe and secure the drain pipe with ligatures.

(d) On the HYDRAULIC MANAGEMENT panel, set the pump selector switch to SHUT and attach a label prohibiting operation of the switch.

(6) In the underwing fillet at the side of nacelle No.3 (Ref. Fig. 415):

(a) Remove the four connecting pipes, items 51, 52, 53 and 54.

(b) Fit blanks, item 23, to the aircraft yellow system pressure and return pipes.

(c) Connect the hydraulic yellow pressure pipeline to the blue pressure pipeline at the T-pieces using the repair pipe, item 29.

(d) Connect the blue and the yellow nacelle return pipes to the blue return pipe to the tank, using repair pipe, item 30.

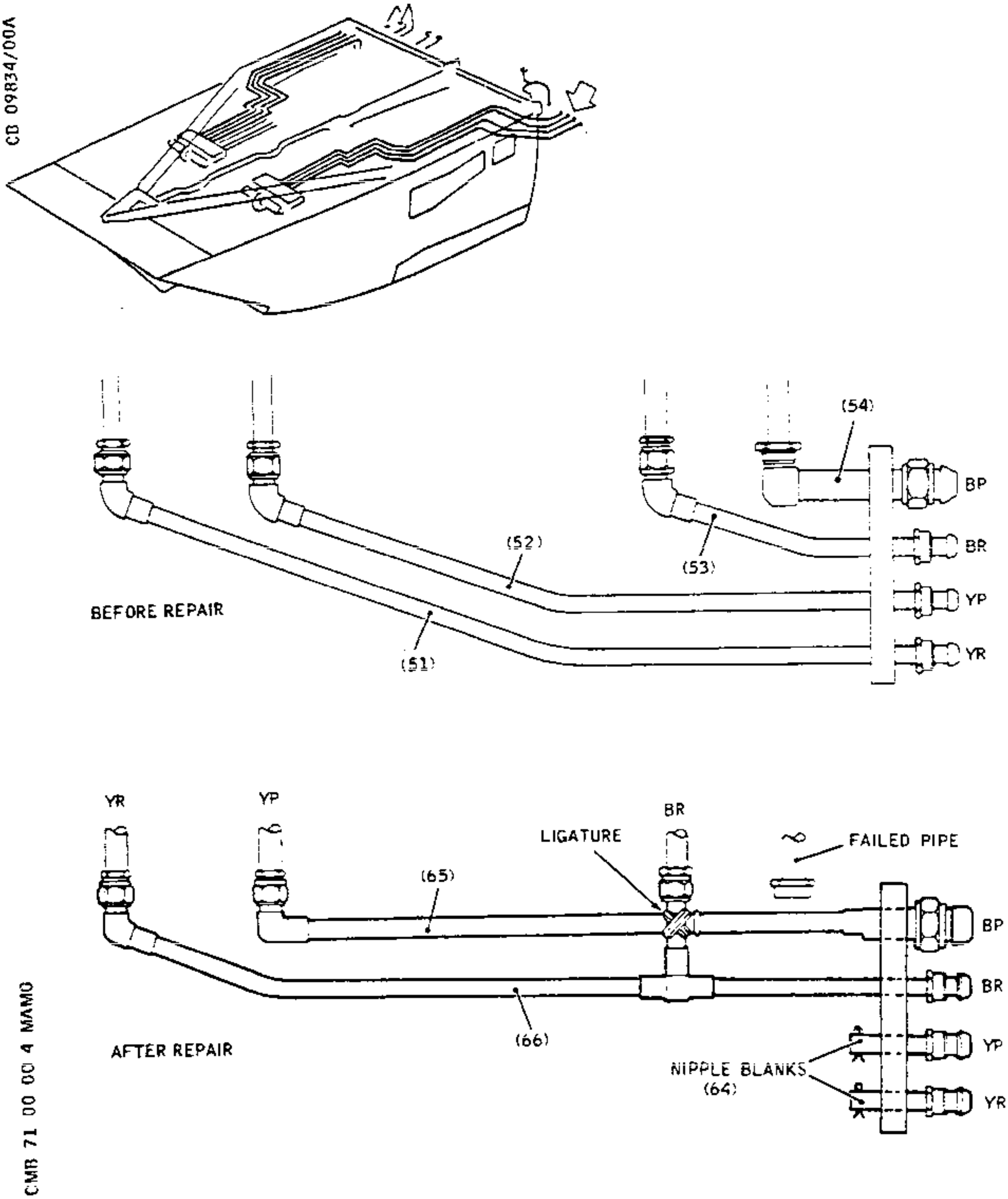
(e) Secure the two repair pipes together using a ligature.

(7) Adjust the fluid levels of the blue and yellow reservoirs (Ref. 12-12-29).

(8) Pressurise the hydraulic blue system by running engine No.4. Check for leaks at:

(a) Repair pipes in the underwing fillet.

(b) Special pipes above the rear ramps.



Repair Pipes in Underwing Fillet -
Intake No.3 (Pipe 3-1)
Figure 415

(c) Pressure blank in the T-piece above the rear ramp.

(9) Pressurize the hydraulic yellow system by running engine No.2 or by using the ground pressurizing system (Ref. para.4A) and check for leaks in the underwing fillet.

(10) Raise the ramps in intakes Nos.3 and 4 by disengaging the brake using the brake release tool, item 22, as detailed on the attached label and manually turning the screwjack. When fully raised re-apply the brake.

(11) Top-up the hydraulic system blue and yellow reservoirs (Ref. 12-12-29).

(12) On the AIR INTAKES panel, set the hydraulic selector switches for intakes Nos.3 and 4 to BLUE and attach a label prohibiting use of the switches.

Q. Pipe 3-2. Failure of Blue System Pressure Pipe (Ref. Fig. 406)

NOTE: At the completion of this procedure the non-return valve in the filter head prevents loss of fluid into the failed pipe.
Engine No.3 hydraulic system blue pump will be inoperative.
All intakes will be fully operative.

(1) Depressurize the hydraulic blue system reservoir (Ref. 29-12-00, Servicing).

(2) Isolate the hydraulic blue system pump on engine No.3, as instructed for pipe 3-1 in para.P, operation (5).

(3) Replenish and pressurize the hydraulic blue system reservoir (Ref. 12-12-29).

(4) Pressurize the hydraulic blue system by running engine No.4 (Ref. para.4A) and operate the spill door in intake No.3 to bleed the circuit.

(5) Check for leakage from the failed pipe by monitoring the tank fluid levels.

(6) Top-up the reservoir (Ref. 12-12-29).

R. Pipe 3-3. Failure of Blue System Return Pipe

(Ref. Fig. 406)

NOTE: At the completion of this procedure, intakes Nos.3 and 4 are not supplied by the hydraulic blue system. Leakage of fluid into the failed pipe is limited to that which transfers from the yellow system across the spools of the change-over valves of the spill door actuators of intakes Nos.3 and 4.

(1) Lower the ramps in intakes Nos.3 and 4.

(2) Depressurize the hydraulic blue system reservoir (Ref. 29-12-00, Servicing).

(3) In the underwing fillet on the side of nacelle No.3 remove the blue system return pipe, item 53 and fit nipple blank, item 23, to the open pipe on the aircraft side.

(4) In the filter bay at the side of intake No.3, remove the blue system pressure pipe supplying the spill door selector; fit blanks, items 8 and 5, to the filter and selector valve (Ref. Fig. 416).

(5) In the filter bay at the side of intake No.4, remove the blue system pressure pipe supplying the spill door selector; fit blanks, items 8 and 5, to the filter and selector valve (Ref. Fig. 417).

(6) Above the rear ramp in intake No.3 remove the blue system pressure pipe, item 48, supplying the ramp actuator. Fit pressure blanks, item 5, to the T-piece and the inlet port of the ramp actuator.

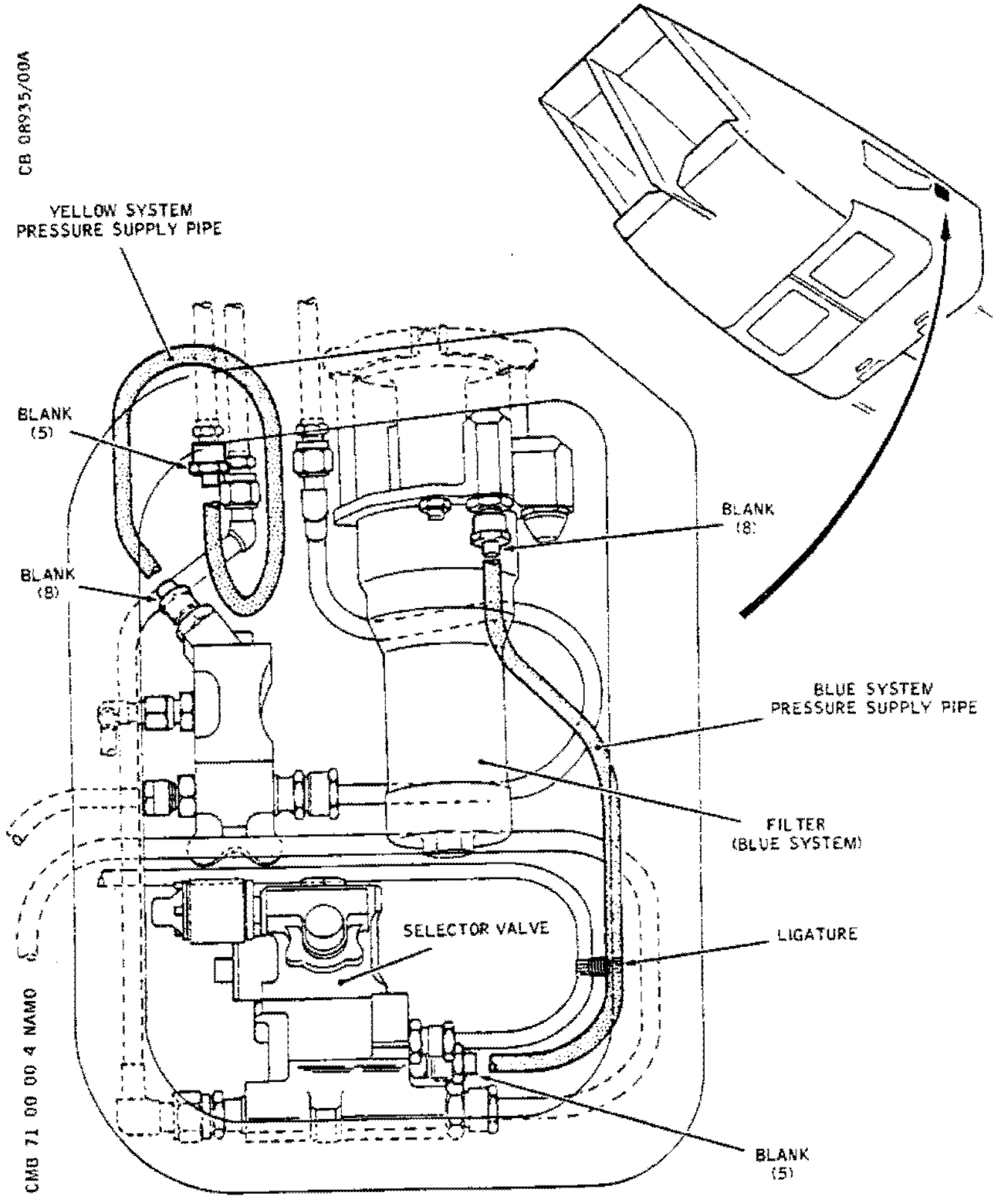
(7) Above the rear ramp in intake No.4 remove the blue system pressure pipe, item 46, supplying the ramp actuator. Fit pressure blanks, item 5, to the T-piece and to the inlet port of the ramp actuator.

(8) Replenish and pressurize the hydraulic blue system reservoir (Ref. 12-12-29).

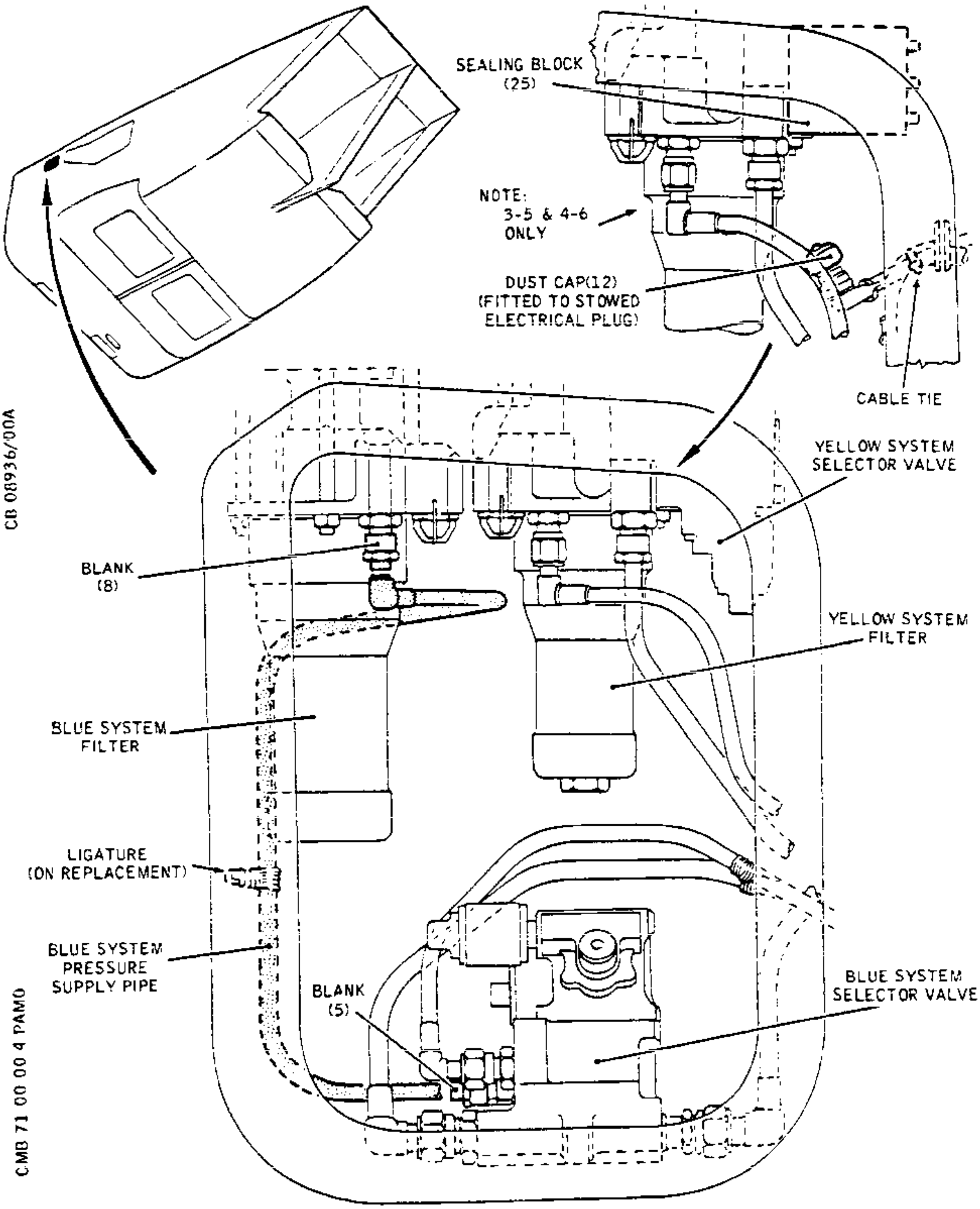
(9) Pressurize the hydraulic blue system by running engine No.4 (Ref. para.4A) to bleed the blue system pressure pipes, and check the pressure seals for leaks:

(a) In the filter bays of intakes Nos.3 and 4.

(b) Above the rear ramps in intakes Nos.3 and 4.



Filter Bay, Intake No.3
Figure 416



Filter Bay, Intake No.4
Figure 417

(c) In the underwing fillet.

(10) Top-up the blue reservoir (Ref. 12-12-29).

(11) On the AIR INTAKES panel, set the hydraulic selector switches for intakes Nos.3 and 4 to YELLOW and attach a label to each switch prohibiting its use.

(12) On the HYDRAULIC MANAGEMENT panel set the two yellow system pump selector switches to ON and attach a label prohibiting use of the switches.

S. Pipe 3-4. Failure of Yellow System Pressure Pipe (Ref. Fig. 406)

NOTE: At the completion of this procedure to isolate the failed pipe the engine No.4 hydraulic yellow system pump will be inoperative and intakes Nos.3 and 4 will not be supplied by the yellow system.

(1) Lower the ramps of intake No.3.

(2) Depressurize the hydraulic yellow system reservoir (Ref. 29-21-00, Servicing).

(3) Isolate the hydraulic yellow system pump on engine No.4 in the same way as instructed for pipe 3-1 in para.P, operation (4).

(4) Above the rear ramp in intake No.3, remove the yellow pressure T-piece at the end of the failed pipe and replace it with special T-piece, item 31, with the blanked end fitted to the failed pipe.

(5) In the underwing fillet at the side of nacelle No.3, remove the yellow pressure pipe, item 52, and fit nipple blank, item 23, to the open end of the aircraft system pipe.

(6) Replenish and pressurize the hydraulic yellow system reservoir (Ref. 12-12-29).

(7) Pressurize the hydraulic yellow system by running engine No.2 or by using the ground pressurizing system (Ref. para.4A), and check for leaks in the underwing fillet.

(8) Top-up the hydraulic reservoirs (Ref. 12-12-29).

(9) On the AIR INTAKES panel, set the hydraulic selector switches for intakes Nos.3 and 4 to BLUE and attach

a label to the switches prohibiting their use.

T. Pipe 3-5. Failure of Yellow System Return Pipe (Ref. Fig. 406)

NOTE: At the completion of this procedure, intakes Nos. 3 and 4 will not be supplied by the hydraulic yellow system. Leakage of fluid into the failed pipe will be limited to the fluid which transfers from the blue system across the spool of the changeover valves of the spill door jacks of engines Nos.3 and 4.

(1) Lower the ramps of intakes Nos.3 and 4.

(2) Depressurize the hydraulic yellow system reservoir (Ref. 29-21-00, Servicing).

(3) In the underwing fillet at the side of nacelle No.3, remove the yellow return pipe, item 51, and fit nipple blank, item 23, to the open end of the aircraft system pipe.

(4) In the filter bay at the side of intake No.3, remove the pipe supplying yellow pressure to the spill door selector valve. Fit blanks, items 8 and 5, to the valve and pressure pipe end (Ref. Fig. 416).

(5) In the filter bay at the side of intake No.4 (Ref. Fig. 417):

(a) Remove the yellow system filter in accordance with 29-11-73.

(b) Remove the selector valve from the filter and in its place fit the sealing block assembly, item 25, fitting the spools in accordance with 20-22-16. Secure the block with the existing washers and bolts; torque tighten the bolt to between 50 and 60 lbf in (0.565 and 0.678 mdaN). Lock the bolts with wire (Ref. 20-21-13).

(c) Refit the filter to the intake as instructed in 29-11-73.

(d) Remove the chain from the dust cap, item 12, and fit the cap to the disconnected electrical supply plug. Stow the plug, using a cable tie, to an adjacent pipe.

(6) Above the rear ramp in intake No.3, remove the yellow pressure pipe, item 49, supplying the ramp actuator and fit pressure blanks, item 5, to the T-piece and the ramp actuator inlet port.

(7) Above the rear ramp in intake No.4, remove the yellow pressure pipe, item 47, supplying the ramp actuator and fit pressure blanks, item 5, to the T-piece and actuator inlet port.

(8) Replenish and pressurize the hydraulic yellow system reservoir (Ref. 12-12-29).

(9) Pressurize the hydraulic yellow system by running engine No.2 or 4 or by using the ground pressurizing system (Ref. para.4A) and check for leaks:

(a) In the filter bays.

(b) At the pressure blanks above the rear ramps in intakes Nos.3 and 4.

(c) At the pressure blank in the underwing fillet.

(10) Top-up the hydraulic yellow system reservoir (Ref. 12-12-29).

(11) On the AIR INTAKES panel, set the hydraulic selector switches for intakes Nos.3 and 4 to BLUE and attach a label to the switches prohibiting their use.

U. Pipe 4-1. Failure of Blue System Pressure Pipe (Ref. Fig. 406)

NOTE: At the completion of this procedure, the non-return valve in the filter head prevents loss of fluid into the failed pipe.
Engine No.4 hydraulic blue system pump will be inoperative.
All air intakes are fully operative.

(1) Depressurize the hydraulic blue system reservoir (Ref. 29-12-00, Servicing).

(2) Isolate the hydraulic blue system pump on engine No.4 (Ref. Fig. 409):

(a) Remove the blue system pump drive shaft in accordance with 29-12-71.

(b) Refit the pump, less the drive shaft, to the

engine as instructed in 29-12-71. Do not proceed beyond the reconnection of hoses to the pump in the re-installation procedure. Leave the blue pressure hose disconnected.

(c) Remove the pump pressure hose and fit pressure blanks, item 1, to the pump and connector block, and blank, item 32, to the shroud drain pipe.

(d) On the HYDRAULIC MANAGEMENT panel, set the pump selector switch to SHUT and attach a label prohibiting use of the switch.

(3) Replenish and pressurize the hydraulic blue system reservoir (Ref. 12-12-29).

(4) Pressurize the hydraulic blue system by running engine No.4 (Ref. para.3A) and check for leaks from the failed pipe by monitoring the tank fluid levels.

(5) Top-up the hydraulic reservoirs (Ref. 12-12-29).

V. Pipe 4-2. Failure of Blue System Pressure Pipe (Ref. Fig. 406)

NOTE: At the completion of this procedure to isolate the failed pipe, engine No.4 hydraulic blue system pump will be inoperative and the blue system supply will not be available for intake No.4.

(1) Lower the ramps of intake No.4 (Ref. para.3A).

(2) Depressurize the hydraulic blue system reservoir (Ref. 29-12-00, Servicing).

(3) Isolate the hydraulic blue system pump on engine No.4 using the procedure given in para.U, operation (2).

(4) Above the rear ramp in intake No.4, remove the blue pressure T-piece and replace it with the special T-piece, item 6, with the blanked end fitted to the failed pipe.

(5) Replenish and pressurize the hydraulic blue system reservoir (Ref. 12-12-29).

(6) Pressurize the hydraulic blue system by running engine No.3 or by using the ground pressurizing system (Ref. para.4A) to bleed the system and check for leaks at the special T-piece.

(7) Top-up the hydraulic blue system reservoir (Ref. 12-12-29).

(8) On the AIR INTAKES panel, set the hydraulic selector switch for intake No.4 to YELLOW and attach a label prohibiting use of the switch.

(9) On the HYDRAULIC MANAGEMENT panel, set the two yellow pump switches to ON and attach a label prohibiting their use.

W. Pipe 4-3. Failure of Blue System Return Pipe (Ref. Fig. 406)

NOTE: At the completion of this procedure, engine No.4 spill door will not be supplied by the hydraulic blue system. Leakage of fluid into the failed pipe is limited to the fluid which transfers from the yellow system across the spool of the change-over valve of engine No.4 spill door actuator.

(1) Lower the ramps in intake No.4.

(2) Depressurize the hydraulic blue system reservoir (Ref. 29-12-00, Servicing).

(3) In the filter bay in the side of intake No.4, remove the blue pressure pipe supplying the spill door selector valve and fit pressure blanks, items 8 and 5, to the connections on the valve manifold and filter (Ref. Fig. 417).

(4) Above the rear ramp intake No.4 remove the blue return T-piece and replace it with special T-piece, item 10, with the blanked end to the failed pipe.

(5) Replenish and pressurize the hydraulic blue system reservoir (Ref. 12-12-29).

(6) Pressurize the hydraulic blue system by running engine No.3 or 4, or by using the ground pressurizing system (Ref. para.4A), and operate the ramps to bleed the circuits. Check for leaks at the blanks in the filter bay and above the rear ramp.

(7) Top-up the hydraulic blue system reservoir (Ref. 12-12-29).

(8) On the AIR INTAKES panel, set the hydraulic selector switch for intake No.4 to YELLOW and attach a label prohibiting use of the switch.

(9) On the HYDRAULIC MANAGEMENT panel, set the two yellow system pump switches to ON and attach a label prohibiting their use.

X. Pipe 4-4. Failure of Yellow System Pressure Pipe (Ref. Fig. 406)

NOTE: At the completion of this procedure, the non-return valve in the filter head prevents loss of fluid into the failed pipe. Engine No.4 hydraulic yellow pump will be inoperative, but all intakes will be fully operative.

(1) Depressurize the hydraulic yellow system reservoir (Ref. 29-21-00, Servicing).

(2) Isolate the hydraulic yellow system pump on engine No.4 as instructed for pipe 3-1, para.P, operation (4).

(3) Replenish and pressurize the hydraulic yellow system reservoir (Ref. 12-12-29).

(4) Pressurize the hydraulic yellow system by running engine No.2 (Ref. para.4A) and check for leaks from the failed pipe by monitoring the tank fluid levels.

(5) Top-up the hydraulic reservoirs (Ref. 12-12-29).

Y. Pipe 4-5. Failure of Yellow System Pressure Pipe (Ref. Fig. 406)

NOTE: At the completion of this procedure to isolate the failed pipe, engine No.4 hydraulic yellow system pump will be inoperative and intake No.4 will not be supplied by the yellow system.

(1) Lower the ramps in intake No.4 (Ref.para.4A).

(2) Depressurize the hydraulic yellow system reservoir (Ref. 29-21-00, Servicing).

(3) Isolate the hydraulic yellow system pump on engine No.4 as instructed in the procedure for pipe 3-1, para.P, (4).

(4) Above the rear ramp in intake No.4, remove the T-piece from the yellow pressure circuit and in its place fit special T-piece, item 24, with the blanked end to the failed pipe.

(5) Replenish and pressurize the hydraulic yellow system reservoir (Ref. 12-12-29).

(6) Pressurize the hydraulic yellow system by running engine No.2 or by using the ground pressurizing system (Ref. para.4A), and operate the ramps of intakes Nos.3 and 4 to bleed the system. Check for leaks at the T-piece above rear ramp in intake No.4.

(7) Top-up the hydraulic yellow circuit reservoir (Ref. 12-12-29).

(8) On the AIR INTAKES panel, set the hydraulic selector switch for intake No.4 to BLUE and attach a label prohibiting operation of the switch.

Z. Pipe 4-6. Failure of Yellow System Return Pipe (Ref. Fig. 406)

NOTE: At the completion of this procedure to isolate the failed pipe, engine No.4 spill door will not be supplied by the yellow system. Leakage of fluid into the failed pipe will be limited to that which transfers from the blue system across the spool of the changeover valve of engine No.4 spill door actuator.

(1) Lower the ramps of intake No.4.

(2) Depressurize the hydraulic yellow system reservoir (Ref. 29-21-00, Servicing).

(3) Above the rear ramp in intake No.4, remove the T-piece from the yellow system return circuit and in its place fit the special T-piece, item 33, with the blanked end to the failed pipe.

(4) In the filter bay in the side of intake No.4, replace the hydraulic yellow system spill door selector valve with the sealing block assembly (Ref. Fig. 417):

(a) Remove the yellow system filter in accordance with 29-11-73.

(b) Remove the selector valve from the filter and in its place fit the sealing block assembly, item 25, fitting the spools in accordance with 20-22-16. Secure the block with the existing washers and bolts; torque tighten the bolts to between 50 and 60 lbf in (0.565 and 0.678 mdaN). Lock the bolts with wire (Ref.

20-21-13).

(c) Remove the chain from the dust cap, item 12, and fit the cap to the disconnected electrical supply plug. Stow the plug to an adjacent pipe using a cable tie.

(d) Refit the filter to the intake as instructed in 29-11-73.

(5) Replenish and pressurize the hydraulic yellow system reservoir (Ref. 12-12-29).

(6) Pressurize the hydraulic yellow system by running engine No.2 or 4 or by using the ground pressurizing system (Ref. para.4A) and operate the ramps in intakes Nos.1 and 2, using yellow selection, to bleed the circuit.

(7) Check for leaks at the special T-piece above ramp in intake No.4 and at the sealing block in the filter bay.

(8) Top-up the hydraulic reservoirs (Ref. 12-12-29).

(9) On the AIR INTAKES panel, set the hydraulic selector switch for intake No.4 to BLUE and attach a label prohibiting use of the switch.

5. Reactivation of Intake Hydraulics after 3-Intake Ferry

WARNING: OBSERVE THE HYDRAULIC AND ELECTRICAL SAFETY PRECAUTIONS GIVEN IN 29-00-00 AND 24-00-00 RESPECTIVELY.
OBSERVE THE SPECIFIC WARNINGS AND CAUTIONS GIVEN IN THE PARTICULAR SERVICING AND MAINTENANCE PROCEDURES REFERRED TO.

A. General

These procedures are for the reactivation of hydraulics following the interim measures for a three-intake ferry flight, given in para.4.

Pipes retain the same identities given them in para.4. For example, a failed pipe procedure code idented 2-5 in para.4 will have its reinstatement procedure under 2-5 in para.5.

All pipes in the following procedures are to be connected and disconnected in accordance with the instructions given

in 29-00-00 and/or 71-62-00, as appropriate, for the removal and installation of hydraulic pipes. Torque figures for pipe nuts are given in Table 402.

Where instructions are given in the following procedures to restrain pipe runs using ligatures, refer to 20-23-14.

When disconnecting hydraulic pipe systems, be prepared with clean receptacles to catch residual fluid draining from the open pipe ends.

B. Equipment and Materials

DESCRIPTION	PART NO.
Pipe 2-2	
Torque spanner (range 500-1000 lbf in; 5-10 mdaN)	-

C. Pipe 1-1. Fit New/Repaired Green System Pressure Pipe (Ref. Fig. 405)

(1) Lower the engine air intake to gain access to the hydraulic piping (Ref. 71-00-11).

(2) Remove the failed pipe assembly 1-1 from the air intake and fit the new or repaired pipe assembly.

(3) Install the engine air intake as instructed in 71-00-11, but omitting the test procedures.

(4) Reinstate the hydraulic green system pump on engine No.1:

(a) Remove the pump in accordance with the instructions in 29-11-71.

(b) Refit the pump, complete with drive shaft, in accordance with 29-11-71.

(c) When recoupling the hydraulic hoses, remove the pressure blanks, item 1, from the pump and connector block and fit the green system pressure supply hose removed for ferry flight (Ref. Fig. 407).

(d) Remove the pressure plug, item 2, from the shroud drain pipe and connect the pipe to the green pressure hose. Remove the ligatures fitted to secure the pipe for ferry flight.

(e) Complete the installation procedure given in 29-11-71, and remove the 'prohibition of use' label from the pump switch on the HYDRAULIC MANAGEMENT panel.

(f) Carry out the pump tests given in 29-11-71.

(5) Carry out the test procedures given in 71-00-11, Removal/Installation.

D. Pipe 1-2. Fit New/Repaired Green System Pressure Pipe (Ref. Fig. 405)

(1) Lower the engine air intake to gain access to the failed hydraulic piping (Ref. 71-00-11).

(2) Above the rear ramp in intake No.2, remove the special T-piece, item 6, and in its place fit the T-piece removed for ferry flight. Connect all three pipes to the T-piece.

(3) Remove the failed pipe assembly, 1-2, from the air intake and fit the new or repaired pipe assembly.

(4) In intake No.1, remove the blank from the rear ramp actuator inlet and reconnect the actuator supply pipe, item 38, (removed for ferry flight) to the inlet and to the new pipe assembly.

(5) Remove the prohibition of use 'label' from the AIR INTAKES panel.

(6) Carry out operations to install the intake, reactivate the green system pump and test the intake and pump hydraulics as given for Pipe 1-1 in para.C, operations (3), (4) and (5).

E. Pipe 1-3. Fit New/Repaired Yellow System Pressure Pipe (Ref. Fig. 405)

(1) Lower the engine air intake to gain access to the failed piping (Ref. 71-00-11).

(2) Remove the special T-piece, item 7, fitted above the rear ramp in intake No.1; in its place fit the T-piece removed for ferry flight.

(3) Remove the failed pipe assembly, 1-3, from the air intake and fit the new or repaired pipe.

(4) Install the engine air intake No.1, as instructed in 71-00-11. When commencing the tests given in the procedure, remove the 'prohibition of use' label from the AIR INTAKES panel.

F. Pipe 1-4. Fit New/Repaired Green System Return Pipe (Ref. Fig. 405)

(1) Lower the engine air intake No.1 to gain access to the failed hydraulic piping (Ref. 71-00-11).

(2) Above the rear ramp on intake No.1, remove the blank from the T-piece, item 55.

(3) Remove the failed pipe, 1-4, from the intake and fit the new or repaired pipe.

(4) In the filter bay at the side of intake No.1, remove the two pressure blanks, items 8 and 5, from the filter head and the spill door selector valve and refit the green system pressure pipe removed for ferry flight (Ref. Fig. 408).

(5) Install the engine air intake to the aircraft as instructed in 71-00-11. When commencing the tests given in the procedure, remove the 'prohibition of use' labels from the AIR INTAKES and HYDRAULIC MANAGEMENT panels.

G. Pipe 1-5. Fit New/Repaired Yellow System Return Pipe (Ref. Fig. 405)

(1) Lower engine air intake No.1 to gain access to the failed pipe (Ref. 71-00-11).

(2) Above the rear ramp in intake No.1, remove the special T-piece, item 10, and in its place refit the T-piece removed for ferry flight.

(3) Remove the failed pipe assembly, 1-5, from the air intake and fit the new or repaired pipe.

(4) In the filter bay in the side of the air intake, remove the pressure blanks, items 8 and 5, fitted to the selector valve and supply pipe and refit the yellow system pipe removed for ferry flight (Ref. Fig. 408).

(5) Install the intake as instructed in 71-00-11. When commencing the tests given in the procedure remove the 'prohibition of use' label from the AIR INTAKES control panel.

H. Pipe 2-1. Fit New/Repaired Green System Pressure Pipe (Ref. Fig. 405)

(1) Lower the engine air intake No.2 to gain access to the failed hydraulic piping (Ref. 71-00-11).

(2) Remove the failed pipe, 2-1, from the air intake and fit the new or repaired pipe assembly.

(3) Install the engine air intake in accordance with 71-00-11, but do not proceed with the test procedures.

(4) Reactivate the hydraulic green system pump on engine No.2:

(a) Remove the pump as instructed in 29-11-71.

(b) Refit the pump complete with drive shaft, in accordance with 29-11-71.

(c) When recoupling the hydraulic hoses remove the pressure blanks, items 1 and 32, from the pump, connector block and rigid pipe and refit the green pressure supply hose, item 69, removed for ferry flight (Ref. Fig. 409).

(d) Complete the installation procedure given in 29-11-71 and remove the 'prohibition of use' label from the HYDRAULIC MANAGEMENT control panel.

(e) Carry out the pump tests given in 29-11-71.

(5) Carry out the test procedures given in 71-00-11, Removal/Installation.

J. Pipe 2-2. Fit New/Repaired Green System Pressure Pipe (Ref. Fig. 405)

(1) Lower the engine air intake to gain access to the failed hydraulic piping (Ref. 71-00-11).

(2) Above the rear ramp in intake No.1:

(a) Remove the special pipe assembly, item 14,

fitted for ferry flight.

(b) Remove the pressure blanks from the yellow pressure and green pressure inlets on the ramp actuator.

(c) Connect the green pressure and yellow pressure supply pipes, items 37 and 38, removed for ferry flight, to the inlets on the ramp actuator and to the connections on the T-pieces.

(3) Above the rear ramp in intake No.2:

(a) Remove the special pipe assembly, item 15, fitted for ferry flight.

(b) Remove the special T-piece, item 6, and in its place fit the T-piece removed for ferry flight.

(c) Remove the pressure blanks from the ramp actuator green pressure and yellow pressure inlets.

(d) Connect the green pressure and the yellow pressure supply pipes, item 39 and 40, removed for ferry flight, to the inlet on the ramp actuator and to the connections on the T-pieces.

(4) In the underwing fillet at the side of nacelle No.2 (Ref. Fig. 414):

(a) Remove the two special pipes, items 20 and 21.

(b) Remove the nipple blanks, item 23, from the yellow system pressure and return pipes.

(c) Refit pipes, items 42, 43, 44 (green return, yellow return, yellow pressure) and elbow assembly, item 45, (green pressure).

(5) Remove the failed pipe assembly, 2-2, from the air intake and fit the new or repaired pipe.

(6) Remove access panels 531AT and BT to gain access to the dry bay above engine No.2 and remove the blanks fitted to the elbow and the non-return valve. Refit the pipes, items 56 and 57, removed for ferry flight (Ref. Fig. 411).

(7) In the filter bay at the side of intake No.2, refit

the spill door hydraulic green system selector valve (Ref. Fig. 410):

(a) Disconnect the electrical plugs from the sealing block socket and the spill door yellow system selector valve socket. Remove the cable ties securing the cable.

(b) Remove the sealing block assembly, item 11, and in its place install the green system selector valve in accordance with the instructions given in 71-62-12.

(c) Reconnect the electrical plug (stowed with a cable tie to adjoining support for ferry flight) to the spill door yellow system selector valve.

(8) In engine bay No.2 (Ref. Fig. 412):

(a) Remove the pressure cap, item 58, from the hydraulic green system pressure supply pipe self-sealing coupling.

(b) Disconnect the green system pressure supply hose, item 60, from the yellow self-sealing coupling and connect it to the green coupling. Slacken the coupling nut to permit correct hose alignment, then re-torque load the nut to between 500 and 825 lbf in (5.65 and 9.35 mdaN).

(c) Remove the pressure blank, item 18, from the yellow system supply pipe and the plug, item 2, from the shroud drain pipe.

(d) Fit the yellow system pressure supply hose, item 59, to the yellow supply pipe and yellow self-sealing coupling.

(e) Remove the ligature securing the shroud drain pipe and secure the pipe to the yellow pressure supply pipe.

(9) Install the engine air intake in accordance with 71-00-11, but do not proceed with test procedures.

(10) Reinstate the hydraulic yellow system pump on engine No.2 (Ref. Fig. 413):

(a) Remove the pump as instructed in 29-21-71.

(b) Refit the pump, complete with drive shaft, in

accordance with 29-21-71.

(c) When recoupling the hydraulic hoses remove the pressure blanks, item 18, from the pump and connector block and fit the yellow supply hose, item 61.

(d) Remove the ligature securing the shroud drain pipe and remove the plug, item 9, from the shroud drain pipe. Secure the drain pipe to the yellow supply hose.

(e) Complete the installation procedure given in 29-21-71 and remove the 'prohibition of use' labels from the HYDRAULIC MANAGEMENT panel and the AIR INTAKES panel.

(f) Carry out the pump tests given in 29-21-71.

(g) Carry out the spill door selector test (Ref.71-62-12, Adjustment/Test).

(11) Carry out the test procedures given in 71-00-11, Removal/Installation.

K. Pipe 2-3. Fit New/Repaired Yellow System Pressure Pipe (Ref. Fig. 405)

(1) Lower the engine air intake to gain access to the failed piping (Ref. 71-00-11).

(2) Remove the failed pipe assembly, 2-3, and in its place fit the new or repaired pipe.

(3) Install the engine air intake in accordance with 71-00-11. Do not carry out the test procedure.

(4) Reactivate the hydraulic yellow system pump on engine No.2 as instructed for Pipe 2-2, para.J, (10).

(5) Carry out the test procedures given in 71-00-11.

L. Pipe 2-4. Fit New/Repaired Yellow System Pressure Pipe (Ref. Fig. 405)

(1) Lower the engine air intake to gain access to the failed piping (Ref. 71-00-11).

(2) Above the rear ramp in intake No.2, remove the special T-piece, item 24, and refit the T-piece removed for ferry flight.

(3) Remove the failed pipe, 2-4, and in its place fit the new or repaired pipe.

(4) Install the yellow pressure pipe, item 44, removed from the underwing fillet for ferry flight.

(5) Install the air intake in accordance with 71-00-11, but omitting the test procedures.

NOTE: The nipple blank, item 23, fitted to the yellow system pressure pipe will be removed during this operation.

(6) Reactivate the hydraulic yellow system pump on engine No.2 as instructed for Pipe 2-2, para.J, (10).

(7) Carry out the test procedures given in 71-00-11.

M. Pipe 2-5. Fit New/Repaired Green System Return Pipe (Ref. Fig. 405)

(1) Lower the engine air intake to gain access to the failed piping (Ref. 71-00-11).

(2) Above the rear ramp in intake No.1, remove the pressure blanks from the ramp actuator and T-piece and fit the green pressure supply pipe, item 38.

(3) Above the rear ramp in intake No.2, remove the pressure blanks from the ramp actuator and T-piece and fit the green pressure supply pipe, item 39.

(4) Remove the failed pipe, 2-5, and in its place fit the new or repaired pipe.

(5) Fit the green system return pipe, item 42, removed for ferry flight, from the underwing fillet position at the side of nacelle No.2.

(6) In the filter bay at the side of intake No.1, remove the pressure blanks, items 8 and 5, from the filter head and selector valve manifold and refit the green system pressure pipe (Ref. Fig. 408).

(7) In the filter bay at the side of intake No.2, remove the pressure blanks, items 8 and 5, from the filter head and selector manifold and refit the green system pressure pipe (Ref. Fig. 410).

(8) Install and test the air intake in accordance with 71-00-11. The nipple blank, item 23, fitted to the

green return pipe at the underwing fillet position and the 'prohibition of use' labels, on the AIR INTAKES and HYDRAULIC MANAGEMENT panels will be removed during this operation.

N. Pipe 2-6. Fit New/Repaired Green System Return Pipe (Ref. Fig. 405)

(1) Lower the air intake to gain access to the failed pipe (Ref. 71-00-11).

(2) Above the rear ramp on intake No.2, replace the special T-piece, item 24, with the T-piece removed for ferry flight.

(3) Remove the failed pipe, 2-6, and in its place fit the new or repaired pipe.

(4) Fit the yellow system return pipe, item 43, removed for ferry flight from the underwing fillet position of intake No.2.

(5) In the filter bay at the side of intake No.2 (Ref. Fig. 410):

(a) Remove the sealing block assembly, item 67, from the filter head.

(b) Remove the cable tie securing the stowed electrical plug.

(c) Fit the spill door selector valve as instructed in 71-62-12.

(6) Install and test the air intake in accordance with 71-00-11. The nipple blank, item 23, at the underwing fillet position, and the 'prohibition of use' label on the AIR INTAKES panel will be removed during this procedure.

(7) Test the spill door selector valve (Ref. 71-62-12, Adjustment/Test).

P. Pipe 3-1. Fit New/Repaired Blue System Pressure Pipe (Ref. Fig. 406)

(1) Lower the intake to gain access to the failed pipe (Ref. 71-00-11).

(2) Above the rear ramp in intake No.4:

(a) Remove the special pipe, item 26, connecting the blue and the yellow pressure supply pipes for ferry flight.

(b) Remove the blanks from the ramp actuator inlets.

(c) Fit the yellow and the blue system supply pipes, items 46 and 47, to the ramp actuator and T-pieces.

(3) Above the rear ramp in intake No.3:

(a) Remove the special pipe, item 27, connecting the blue and the yellow pressure supply pipes for ferry flight.

(b) Remove the blanks at the ramp actuator inlets and the T-piece.

(c) Install the yellow and the blue system supply pipes, items 48 and 49, to the ramp actuator and T-pieces.

(4) Remove the failed pipe, 3-1, and in its place fit the new or repaired pipe.

(5) At the side of intake No.3 at the underwing fillet position (Ref. Fig. 415):

(a) Remove the two repair pipes, items 65 and 66, connecting blue pressure to yellow pressure and blue return to yellow return.

(b) Fit the four connecting pipes, items 51, 52, 53 and 54 to the intake.

(6) Install the intake to the aircraft as instructed in 71-00-11, but omitting the test procedure.

NOTE: The nipple blanks, item 23, at the underwing fillet position and the 'prohibition of use' labels on the AIR INTAKES panel will be removed during this procedure.

(7) Reactivate the hydraulic blue system pump on engine No.3 (Ref. Fig. 407):

(a) Remove the pump as instructed in 29-12-71.

(b) Refit the pump, complete with drive shaft, in accordance with 29-12-71.

(c) When recoupling the hydraulic hoses remove the pressure blanks, item 1, from the pump and connector block and fit the blue system pressure supply hose, item 68, removed for ferry flight.

(d) Remove the plug, item 2, from the shroud drain pipe and connect the pipe to the blue pressure hose. Remove the ligatures fitted to secure the pipe for ferry flight.

(e) Complete the installation procedure given in 29-12-71, and remove the 'prohibition of use' label from the pump switch on the HYDRAULIC MANAGEMENT panel.

(f) Carry out the pump tests in 29-12-71.

(8) Reactivate the hydraulic yellow system pump on engine No.4 (Ref. Fig. 413):

(a) Remove the pump as instructed in 29-12-71.

(b) Refit the pump, complete with drive shaft, in accordance with 29-12-71.

(c) When recoupling the hydraulic hoses remove the pressure blanks, item 18, from the pump and connector block and fit the yellow supply hose, item 61.

(d) Remove the ligature securing the shroud drain pipe and remove the plug, item 9, from the drain pipe. Connect the drain pipe to the yellow supply hose.

(e) Complete the installation procedure given in 29-12-71, during which remove the 'prohibition of use' labels from the AIR INTAKES and HYDRAULIC MANAGEMENT panels.

(f) Carry out the pump tests given in 29-12-71.

(9) Carry out the test procedure given in 71-00-11, following installation of the intake.

Q. Pipe 3-2. Fit New/Repaired Blue System Pressure Pipe (Ref. Fig. 406)

(1) Lower the intake to gain access to the failed pipe (Ref. 71-00-11).

(2) Remove the failed pipe assembly, 3-2. In its place fit the new or repaired pipe.

(3) Install the intake in accordance with 71-00-11, but omitting the test procedure.

(4) Reactivate the hydraulic blue system pump on engine No.3 as instructed for Pipe 3-1, para.P, (7).

(5) Carry out the test procedure following installation of the intake (Ref. 71-00-11).

R. Pipe 3-3. Fit New/Repaired Blue System Return Pipe (Ref. Fig. 406)

(1) Lower the air intake to gain access to the failed pipe (Ref. 71-00-11).

(2) Above the rear ramp in intake No.3, remove the pressure blanks from the T-piece and the inlet port of the ramp actuator and refit the blue system pressure supply pipe, item 48.

(3) Above the rear ramp in intake No.4, remove the pressure blanks from the T-piece and the ramp actuator inlet and refit the blue system pressure supply pipe, item 46.

(4) Remove the failed pipe, 3-3, from the intake. Fit the new or repaired pipe.

(5) At the underwing fillet position on intake No.3, fit the blue system pressure return pipe, item 53, removed for ferry flight.

(6) In the filter bay at the side of intake No.3, remove the pressure blanks, items 8 and 5, from filter and selector valve and refit the blue system pressure supply pipe (Ref. Fig. 416).

(7) In the filter bay at the side of intake No.4, remove the blanks, items 8 and 5, fitted to the filter and selector valve and refit the blue system pressure supply pipe (Ref. Fig. 417).

(8) Install and test the air intake in accordance with 71-00-11. During this procedure remove the nipple blank, item 23, at the underwing fillet position and the 'prohibition of use' labels from the AIR INTAKES and the HYDRAULIC MANAGEMENT panels.

S. Pipe 3-4. Fit New/Repaired Yellow System Pressure Pipe

(Ref. Fig. 406)

(1) Lower the air intake to gain access to the failed pipe (Ref. 71-00-11).

(2) Above the rear ramp in intake No.3, remove the special T-piece, item 31, and refit the T-piece removed for ferry flight.

(3) Remove the failed pipe, 3-4, from the intake. In its place fit the new or repaired pipe.

(4) In the underwing fillet position on the intake fit the yellow system pressure pipe, item 52, that was removed for ferry flight.

(5) Install the air intake as instructed in 71-00-11 omitting the test procedure. The nipple blank, item 23, fitted at the underwing fillet position and the 'prohibition of use' labels appended to the AIR INTAKES panel will be removed during this procedure.

(6) Reactivate the yellow system pump on engine No. 4, as in para, P, (8).

(7) Carry out the test procedure (Ref. 71-00-11, Adjustment/Test).

T. Pipe 3-5. Fit New/Repaired Yellow System Return Pipe (Ref. Fig. 406)

(1) Lower the air intake to gain access to the failed pipe (Ref. 71-00-11).

(2) Above the rear ramp in intake No.3, remove the pressure blanks fitted to the ramp actuator inlet and to the T-piece and refit the yellow system pressure supply pipe, item 49.

(3) Above the rear ramp in intake No.4, remove the pressure blanks fitted to the ramp actuator inlet port and to the T-piece and refit the yellow system pressure supply pipe, item 47.

(4) Remove the failed pipe, 3-5, from the intake. In its place fit the new or repaired pipe.

(5) At the underwing fillet position on the intake, refit the yellow system pressure return pipe, item 51.

(6) In the filter bay at the side of intake No.3, remove

the blanks, items 8 and 5, from the pressure pipe and the spill door selector valve and refit the yellow system pressure supply pipe (Ref. Fig. 416).

(7) In the filter bay at the side of intake No.4, remove the sealing block, item 25, fitted for ferry flight (Ref. Fig. 417) and install the spill door selector valve in accordance with 71-62-12, Removal/ Installation, less the test procedure.

(8) Install and test the air intake in accordance with 71-00-11. During this procedure remove the nipple blank, item 23, at the underwing fillet position and remove the 'prohibition of use' labels from the AIR INTAKES panel. Carry out the spill door selector valve test in 71-62-12.

U. Pipe 4-1. Fit New/Repaired Blue System Pressure Pipe (Ref. Fig. 406)

(1) Lower the intake to gain access to the failed pipe (Ref. 71-00-11).

(2) Remove the failed pipe assembly, 4-1, from the intake and in its place fit the new or repaired pipe.

(3) Install the air intake as instructed in 71-00-11, but omitting the test procedure.

(4) Reactivate the hydraulic blue system pump on engine No.4 (Ref. Fig. 409):

(a) Remove the pump (Ref. 29-12-71).

(b) Refit the pump, complete with drive shaft, in accordance with 29-12-71.

(c) When recoupling the hydraulic hoses remove the pressure blanks, item 1 and 32, from the pump, connector block and rigid pipe and refit the blue system pressure supply hose, item 69, removed for ferry flight.

(d) Complete the installation procedure given in 29-12-71 and remove the 'prohibition of use' label, from the pump switch on the HYDRAULIC MANAGEMENT panel.

(e) Carry out the pump test procedure in 29-12-71.

(5) Carry out the test procedures given in 71-00-11,

following installation of the intake.

V. Pipe 4-2. Fit New/Repaired Blue System Pressure Pipe (Ref. Fig. 406)

(1) Lower the intake to gain access to the failed pipe (Ref. 71-00-11).

(2) Above the rear ramp in intake No.4, remove the special T-piece, item 6, and refit the T-piece removed for ferry flight.

(3) Remove the failed pipe assembly, 4-2, and fit the new or repaired pipe.

(4) Install the intake in accordance with 71-00-11, but omitting the test procedure.

(5) Reactivate the hydraulic blue system pump on engine No.4 using the procedure given for pipe 4-1 in para.U, (4).

(6) Carry out the test procedure given in 71-00-11, following installation of the intake. During this procedure remove the 'prohibition of use' label from the AIR INTAKES panel.

W. Pipe 4-3. Fit New/Repaired Blue System Return Pipe (Ref. Fig. 406)

(1) Lower the intake to gain access to the failed pipe (Ref. 71-00-11).

(2) Above the rear ramp in intake No.4, remove the special T-piece, item 10, and refit the T-piece removed for ferry flight.

(3) In the filter bay in the side of intake No.4, remove the pressure blanks, items 5 and 8, fitted to the connections on the spill door selector valve manifold and the filter, and refit the blue system pressure supply pipe. Secure the pipe with a ligature as shown (Ref. Fig. 417).

(4) Remove the failed pipe, 4-3, in its place fit the new or repaired pipe.

(5) Install and test the intake as instructed in 71-00-11. During this procedure remove the 'prohibition of use' labels from the AIR INTAKES and HYDRAULIC MANAGEMENT panels.

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X. Pipe 4-4. Fit New/Repaired Yellow System Pressure Pipe (Ref. Fig. 406)

(1) Lower the intake to gain access to the failed pipe (Ref. 71-00-11).

(2) Remove the failed pipe assembly, 4-4. In its place fit the new or repaired pipe.

(3) Install the intake as instructed in 71-00-11, but omitting the test procedure.

(4) Reactivate the hydraulic yellow system pump on engine No.4 as instructed for pipe 3-1, para.P, (8).

(5) Carry out the test procedures given in 71-00-11, following installation of the intake.

Y. Pipe 4-5. Fit New/Repaired Yellow System Pressure Pipe (Ref. Fig. 406)

(1) Lower the intake to gain access to the failed pipe (Ref. 71-00-11).

(2) Above the rear ramp on intake No.4, remove the special T-piece, item 24, and refit the T-piece removed for ferry flight.

(3) Remove the failed pipe, 4-5, from the intake. In its place fit the new or repaired pipe.

(4) Install the intake in accordance with 71-00-11, but omitting the test procedure.

(5) Reactivate the hydraulic yellow system pump on engine No.4 as instructed for pipe 3-1 in para.P (8).

(6) Carry out the test procedure given in 71-00-11, following installation of the intake.

Z. Pipe 4-6. Fit New/Repaired Yellow System Return Pipe (Ref. Fig. 406)

(1) Lower the air intake to facilitate removal of the failed pipe (Ref. 71-00-11).

(2) Above the rear ramp in intake No.4, remove the special T-piece, item 33, and refit the T-piece removed for ferry flight.

(3) Remove the failed pipe assembly, 4-6. In its place

fit the new or repaired pipe.

(4) In the filter bay in the side of intake No.4, remove the sealing block, item 25, fitted for ferry flight, from the yellow filter (Ref. Fig. 417) and in its place fit the spill door yellow system selector valve in accordance with 71-62-12, Removal/ Installation.

(5) Install and test the intake (Ref. 71-00-11). During this procedure remove the 'prohibition of use' label from the AIR INTAKES panel.

(6) Carry out the spill door selector test (Ref. 71-62-12, Adjustment/Test).

POWER PLANT - ADJUSTMENT/TEST

TABLE 1 - ENGINE RUN TEST REQUIREMENTS

		Component Repaired, Replaced or Refitted		Tests Required for Certification commencing at para.9
RB	1.	Re-installation of same engine in same position		3, 4, 6, 7, 9, 11, 18
RB RB	2.	Installation of 'Robbed' engine		3, 4, 6, 7, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 24, 25, 27, 28
RB RB	3.	Installation of Repaired/Refurbished engine		3, 4, 6, 7, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 23, 24, 25, 27, 28
RB RB RB	4.	Engines in which the LH Gearbox or RH Gearbox modules have been changed on wing		3, 4, 6, 7, 9, 11, 13, 14, 18, 25, 27, 28
RB B	5.	Fuel System Components (Dry)		4, 9, 11, 12, 13, 18, 19, 20, 23, 25, 27
B RB		FCU and 2nd Stage Pump		4, 9, 11, 12, 13, 18, 19, 20, 23, 25, 27
B B		1st Stage Pump	)	4, 9, 11, 12, 13, 18, 19, 20, 23, 25, 27
		Start Pump	)These tests need	" " "
		Recirculation Valve	)only be carried	" " "
		Fuel Manifold	)out if a static	" " "
		Fuel Sprayer (Pilot)	)leak check has	" " "
		Fuel Atomizing Nozzle	)not been carried	" " "
		Fuel Temp. Bulb	)out	" " "
		Fuel Filter	)	" " "
		Main Fuel Flowmeter	)	" " "
		Fuel cooled oil cooler - Posn.2 & 4		As in 1
		- Posn.1 & 3		4, 6, 9, 25, 27
		Fuel Heater		4, 6, 9, 16, 25, 27
		Distribution & Dump Valve		4, 6, 9, 25, 27

	Component Repaired, Replaced or Refitted	Tests Required for Certification commencing at para.9
RB 6.	Air System	
	Engine Anti-icing Manifold (IGV Assembly)	As in 1
	Anti-Icing Air Control Valve	4, 6, 9, 15, 25, 27
	Fuel Heat Air Control Valve	4, 6, 9, 16, 25, 27
	PNC Valve	4, 6, 9, 14, *, 25, 27
	PNC Trim	4, 6, 9, 14, *, 25, 27
	Primary Heat Exchanger	As in 1
	Secondary Heat Exchanger	As in 1
RB 7.	Fuel System - Reheat	
	Re-heat Injection System	4, 6, 9, 11, 25, 27
	Re-heat Controller	4, 6, 9, 11, 25, 27
	Re-heat Fuel Flowmeter - Need not be carried out if a static leak check carried out	4, 6, 9, 11, 25, 27
RB 8.	Electrical System	
	Jet Pipe Thermocouple	4, 6, 9, 11, 25, 27
	IDG	4, 6, 8, 9, 26, 25, 27
RB 9.	Oil System	
	Oil Tank - Posn.1 & 3	4, 6, 9, 25, 27
	Posn.2 & 4	As in 1
	Engine Oil Pressure Transmitter	4, 6, 9, 25, 27
	Engine Oil Pressure S/W	4, 6, 9, 25, 27
	Main Oil Pump	4, 6, 9, 17, 25, 27
	Main Oil Pump Relief Valve - Adj/ Replacement	4, 6, 9, 17, 25, 27
	Refitment of engine following extended period of storage	Test as defined in 71-00-00 P/B600 Inspection/Check
	Oil Filters	1
RB 10.	Misc.	
	Hydraulic Pumps	4, 6, 7, 25, 27

* To permit, in certain restricted cases, some easement of the ground running requirements following a change of a PNC valve or a PNC trim unit.

1. Wherever a PNC valve has been changed the tests called up in
R Table 1 Item 6, PNC valve and/or PNC trim MUST be accomplished before the aircraft is flown.

2. Wherever a PN trim unit is replaced the test called up in
R Table 1 Item 6 for the PNC valve and/or PNC trim unit should be carried out if time is available but may be deferred up to a maximum of 50 hours. A Base Carried Forward or ADD entry must be made.

1. Safety Precautions (Ref.Fig.501) also Ref: P-SAF-01-01, P-SAF-01-03, P-SAF-01-04, M-GEN-05-02. BAA D01/20 Rules for Aircraft Ground Running.

A. General

It is recommended that engine ground running or engine test/Calibration purposes be carried out in a detuner.

The best overall safety measure is to ensure that only the engineers directly concerned with engine ground running are present. No other person must be allowed to approach the aircraft. For maximum power running no-one other than engineer on the headset is to be in close proximity to the aircraft.

The dangers are mainly:

(1) An ingestion zone which surrounds the main and auxiliary air intakes.

(2) A hot gas and blast zone which extends rearward of the exhausts, roughly in line with the wing tips.

In addition local orders and regulations on noise must be observed to ensure that the ground crew are not exposed to unacceptable noise levels or noise periods. It is anticipated that most engine ground running will take place with the aircraft on a detuner, particularly when prolonged
R running is envisaged.

B. Personal Precautions

(1) Personnel in the vicinity of ground running aircraft should not wear loose clothing or hooded garments.

(2) A competent person must be on nosewheel intercom, at all times during ground running and in a position where he can observe the ground engineers carrying out adjustments to an engine.

(3) All personnel concerned with ground running are to wear BAOD approved ear defenders. The person on the intercom must wear a headset with built in headphones.

R WARNING: THE FUEL HEATER EXHAUST IN THE FORWARD ENGINE BAY DOOR, IS THE OUTLET FOR VERY HOT GASES WHICH CAN INFLICT A SEVERE BURN.

C. SPECIFIC PRECAUTIONS WHEN USING DETUNERS AT LHR - (Ref. Fig. 501)

Position the aircraft on the detuners as follows. (Assumes landing gear restraint mechanism installed in the detuner).

(1) Push aircraft back until rear wheels contact the rear chock assembly maintaining the aircraft squarely on the guide lines painted on the concrete.

(2) Position the mobile forward chock squarely onto the two forward wheels and engage chains. Tighten chains evenly by means of the turnbuckles.

(3) No person should enter the detuner when the engine is at above idle power. All adjustments, inspections etc. should be carried out at idle power.

(4) When approaching an engine which is running at idle power observe the ingestion boundaries displayed in (Ref. Fig. 501). Gain access to the engine from the side of the aircraft as shown by Arrow A in (Ref. Fig. 501).

(5) If the landing gear restraint mechanism is not fitted to the detuner, proceed as follows:

(a) Position the aircraft in the detuner so that the rear lip of the engine secondary nozzle buckets is approx. 3 feet from the face of the silencers maintaining the aircraft squarely on the guide lines painted on the concrete.

(b) Chock the aircraft main wheels forward and aft using the wooden chocks and secure chocks with chains.

(6) If engine running is to take place at night, the detuner floodlights should be switched on.

D. SPECIFIC PRECAUTIONS WHEN A DETUNER IS NOT AVAILABLE

(1) Observe the ingestion and hot gas boundaries displayed (Ref. Fig. 501). Gain access to the engine from the side of the aircraft as shown by Arrow A in (Ref. Fig. 501).

(2) All adjustments, inspection etc. should be carried out at idle power.

(3) When running at engine power greater than 80% N2, the engineer on the headset (plugged into nosewheel)

should stand at least 10 feet in front of the Nose of the aircraft.

CAUTION: WHEN RUNNING AT POWER SETTINGS GREATER THAN 80% N2, NO PERSON SHOULD BE IN THE VICINITY SHOWN BY THE SHADED AREA IN (Ref. Fig. 502) UNLESS WEARING NOISE SUPPRESSION CLOTHING.

(4) All persons outside the shaded area but within 600 ft radius of the aircraft should wear approved ear defenders.

E. HP VALVE OPERATION

CAUTION: TO MINIMISE THE RISK OF AN ENGINE INTERNAL FIRE WHEN THE ENGINE IS STOPPED, DO NOT OPERATE THE HP VALVE SWITCH TO "OPEN" OR OPEN THE HP VALVE CONTROL CIRCUIT BREAKER, WITH THE THROTTLE MASTER SWITCH AT "MAIN" OR "ALTERN" AND WITH THE AUTO IGNITION SWITCH AT "ON".

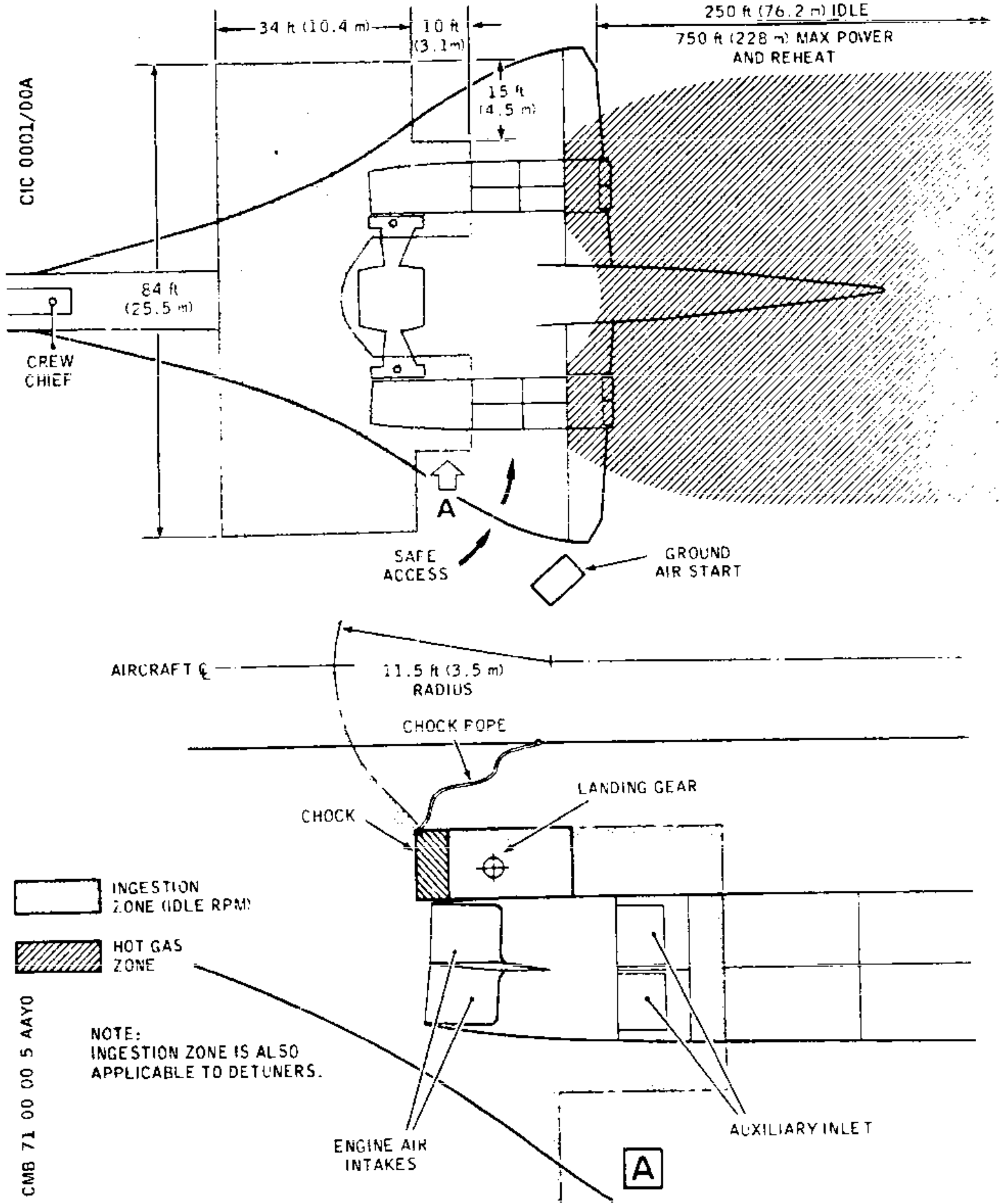
F. FUEL CONTAMINATION OF DRY BAYS ABOVE ENGINES (EA.123)

CAUTION: WOULD ALL CONCERNED PAY PARTICULAR ATTENTION DURING TURN ROUND CHECKS AND PRIOR TO GROUND RUNNING FOR EVIDENCE OF FUEL LEAKAGE FROM THE DRAIN HOLES ASSOCIATED WITH THE ABOVE ENGINE DRY BAYS. FUEL ENTERING THE BAYS (BETWEEN SPARS 66 & 69) IS DIRECTED INTO OVERBOARD DRAINS WHICH EXIT ON THE UNDERSIDE OF THE WING.

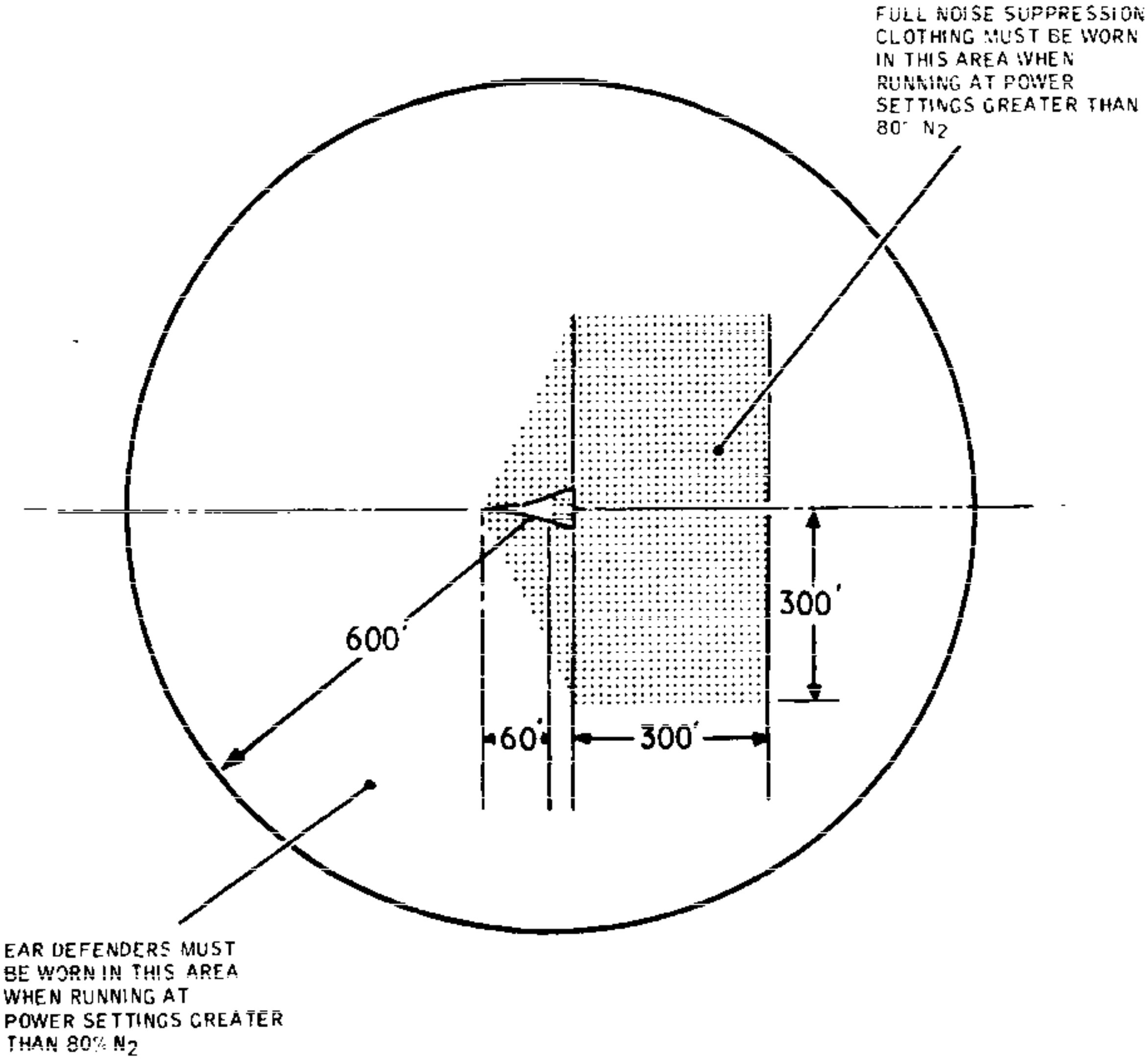
ON THE INBOARD SIDES OF THE NACELLES (ENGINE BAYS 2 AND 3) FUEL IS DRAINED INTO THE FAIRINGS (COVERING HYDRAULIC PIPES) WHICH RUN FORE AND AFT ALONGSIDE THE ENGINE BAY DOORS, AND THEN OVERBOARD.

ON THE OUTBOARD SIDES OF THE NACELLES (ENGINE BAYS 1 AND 4) FUEL IS DRAINED INTO GUTTERS WHICH FORM PART OF THE LOWER SURFACE COVER PLATES OVER THE RIB 12 WING JOINT. ACCUMULATED FUEL EXITS FROM THE REAR AND END OF THE GUTTER AT SPAR 72.

ALL FUEL LEAKAGE INTO THE BAYS SHOULD BE RECTIFIED BEFORE FURTHER FLIGHT AND/OR PRIOR GROUND RUNNING. ACCESS CAN BE GAINED THROUGH THE QUICK RELEASE PANELS ON THE TOP WING SURFACE OVER THE ENGINES AND REPAIRS EFFECTED IAW MM. CHAP.28-11-00.



R Ingestion and Hot Gas Zones B
Figure 501



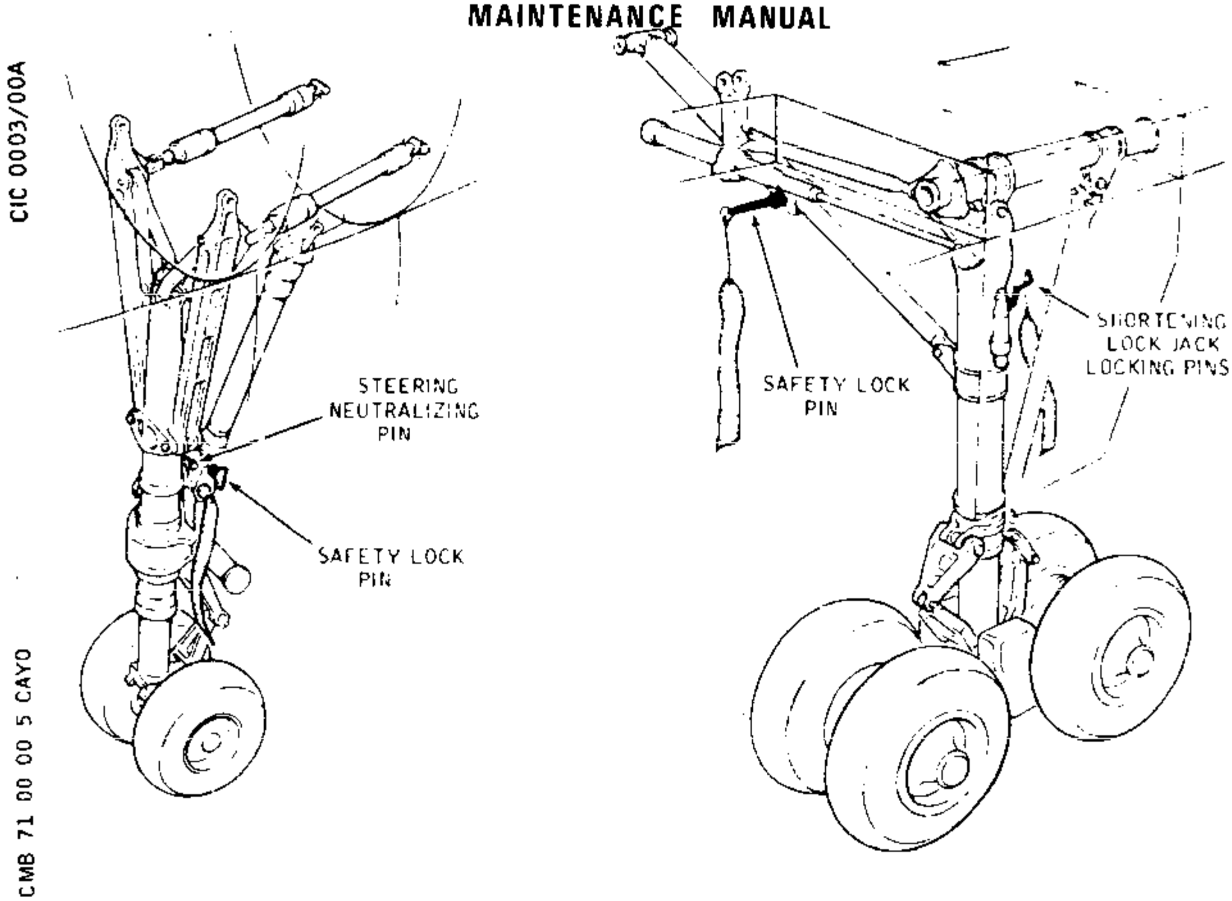
NOTE:
1. EAR DEFENDERS MUST ALSO BE WORN IN THE VICINITY OF AIRCRAFT WHEN ENGINES ARE RUNNING BELOW 80%.
2. ABOVE DISTANCES ASSUME ENGINE RUNNING AT FULL POWER (DRY OR REHEATED) FOR NOT MORE THAN 2 MINUTES.
3. INGESTION AND HOT GAS ZONES SHOWN IN FIG 501 WILL INTERACT WITH THE ABOVE NOISE SAFETY ZONES.

CMB 71 00 00 5 BAYO

Engine Ground Running without detuners
Noise Safety Zones
Figure 502

B

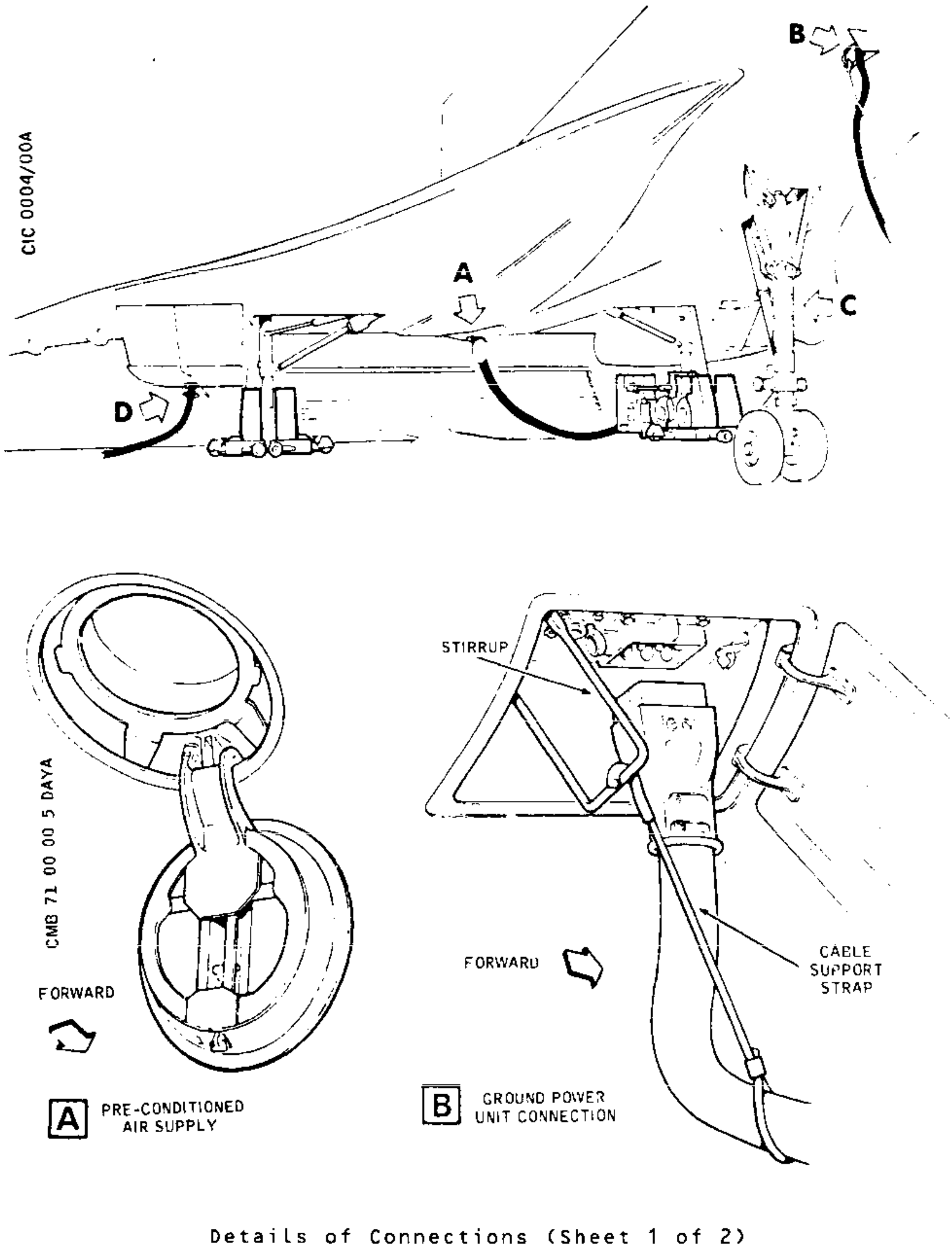
R



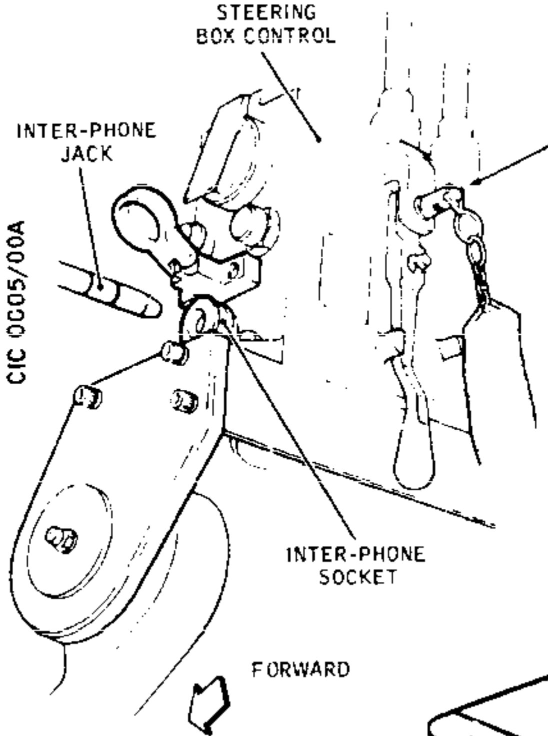
Landing Gear Ground Locks B
Figure 503

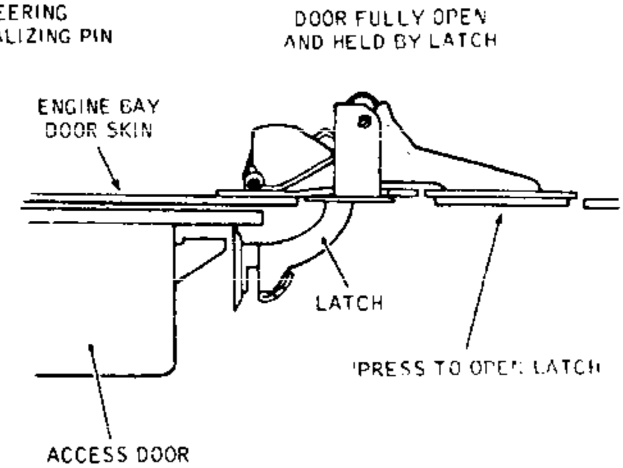
2. EQUIPMENT AND MATERIALS

DESCRIPTION	PART NO.
Ground power unit standard 200/115 volts a.c. 400 Hz. three-phase unit with ISO connectors. Recommended capacity 90 Kva. Supply character-isitics to Spec. MIL-STD-704.	-
Pre-conditioned air supply trolley - Maximum air flow 220 lb/min (1.66 Kg/sec.) Maximum temperature 55 deg C.	-
Ground air start rig standard unit with 3 in. (76 mm) diameter, quick release to S.D.M. 322, coupling. Air supply requirement of 2 lb per second (0.91 Kg) at 40 p.s.i. (2.7 bars) to a maximum temperature of 250 deg. C.	-
Landing gear restraint equipment	-

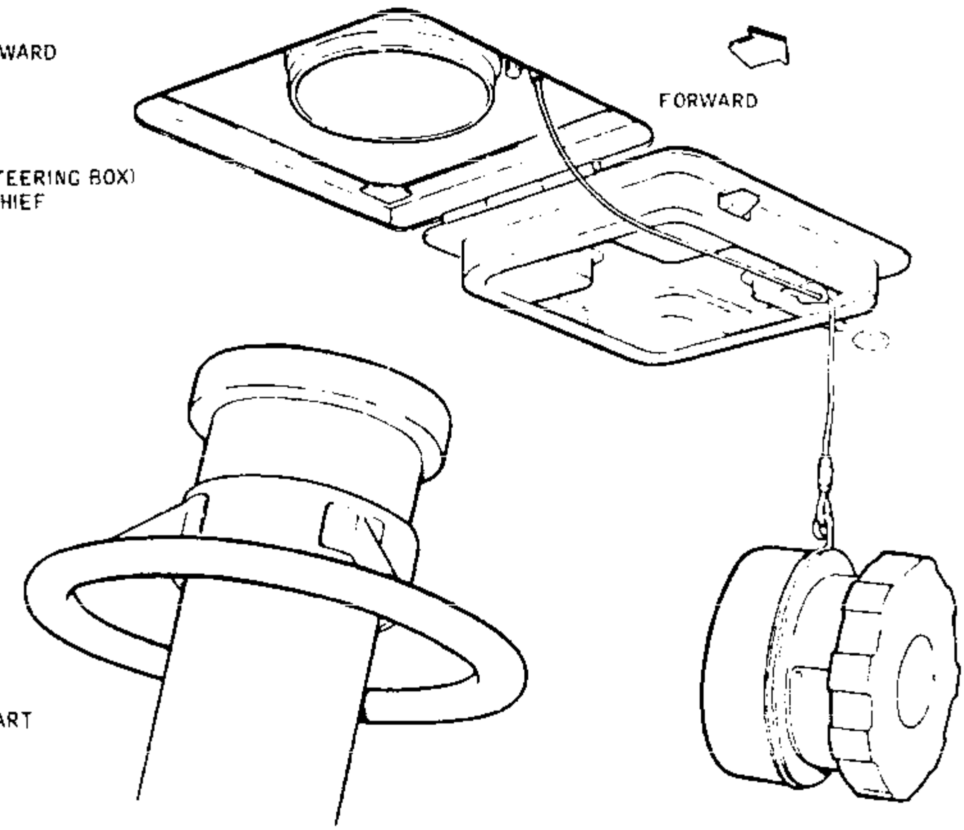


Details of Connections (Sheet 1 of 2) B
R Figure 504





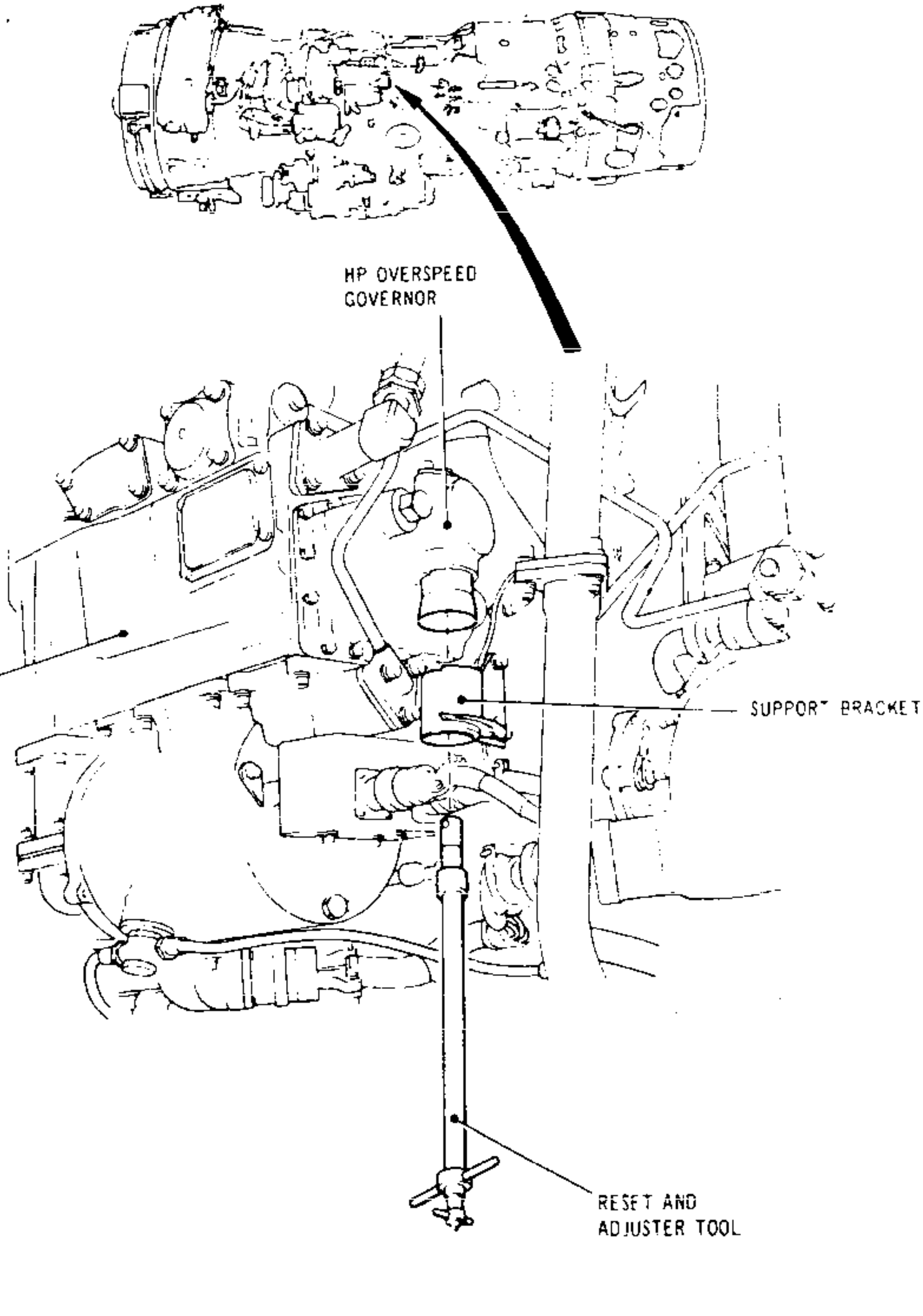
C INTER-PHONE (STEERING BOX)
CREW CHIEF



D
GROUND AIR START
CONNECTION

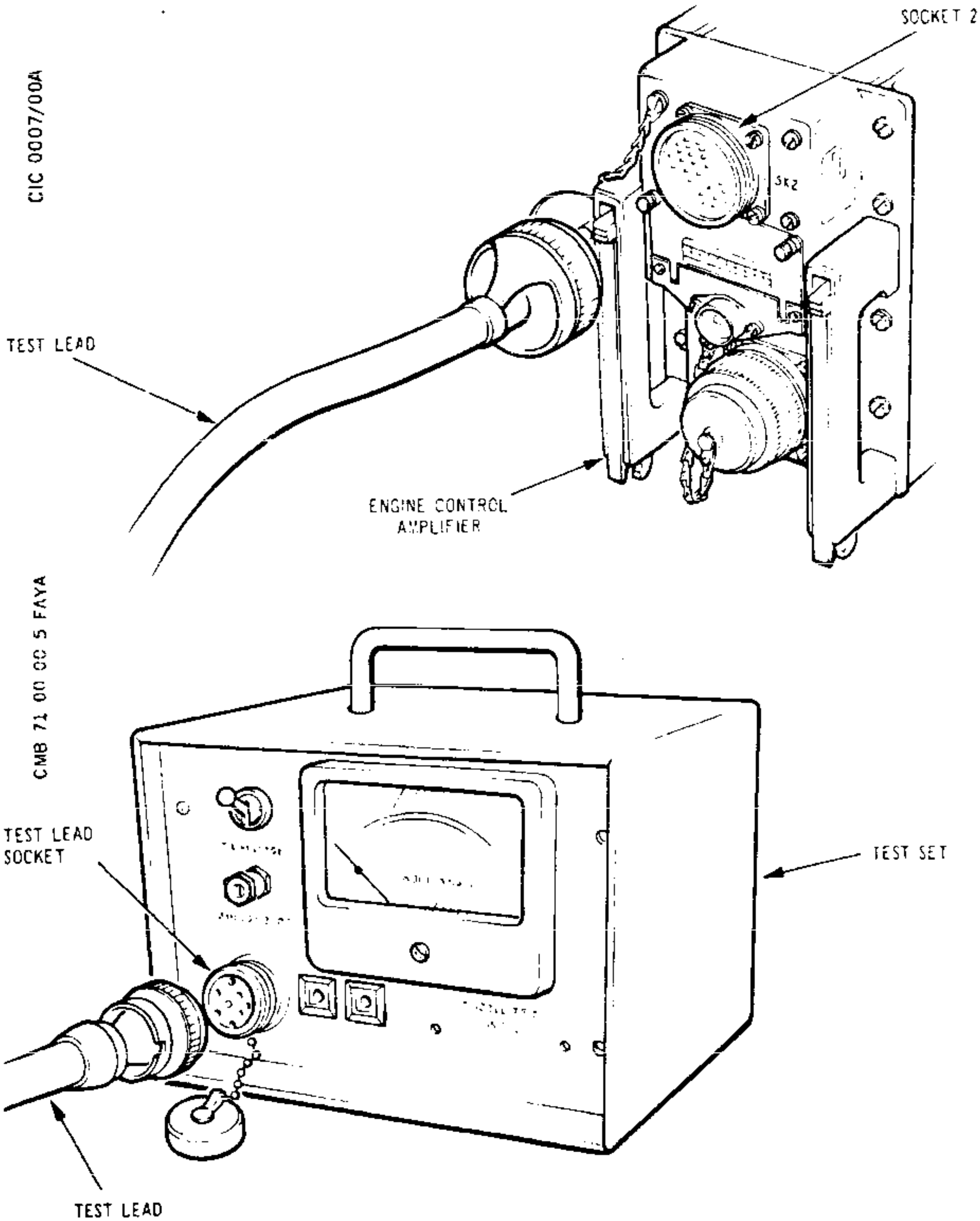
Details of Connections (Sheet 2 of 2) B
R Figure 504

CIC 00:06/00A



CMB 71 00 00 5 EAYO

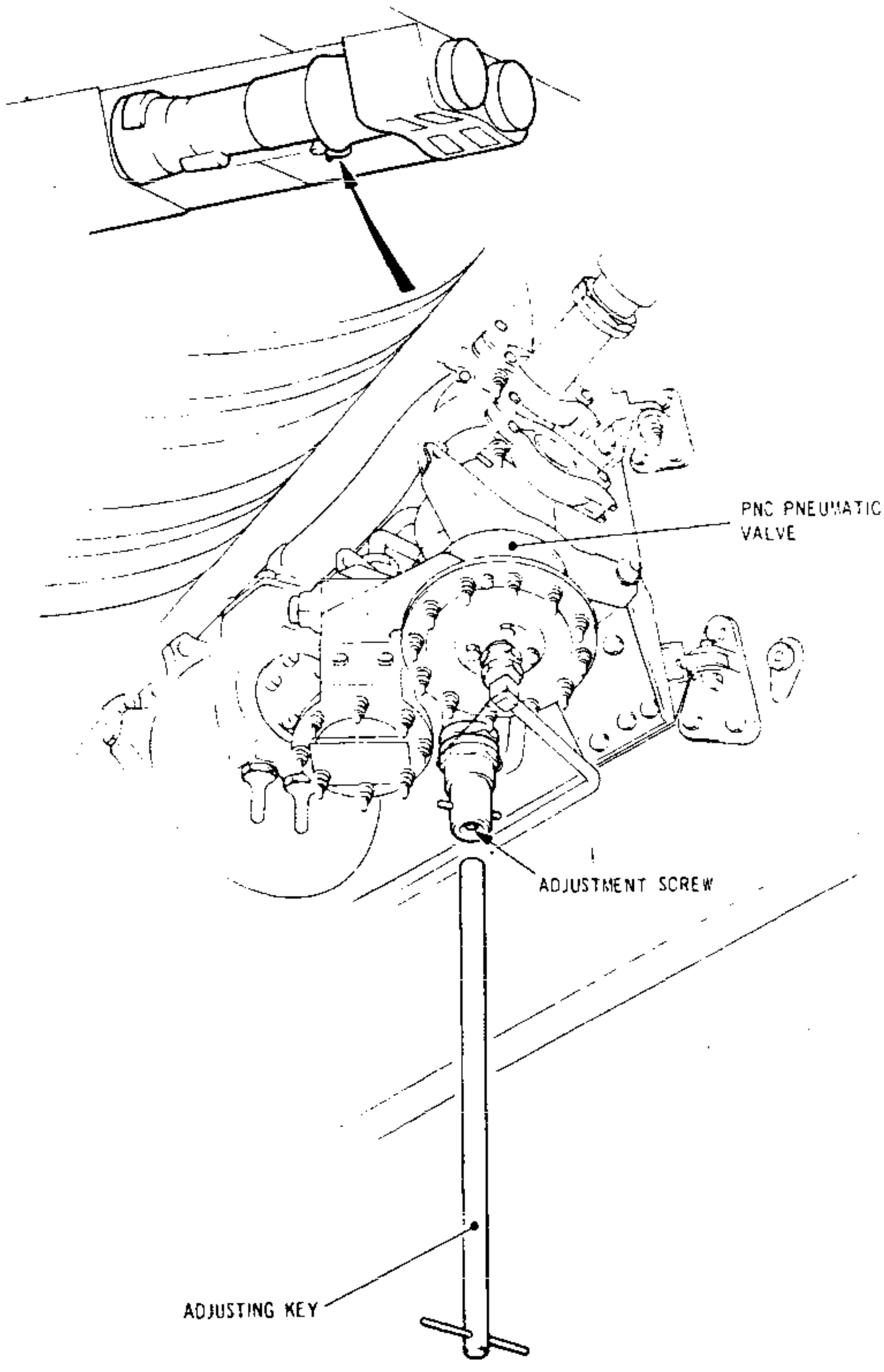
HP Overspeed (N2) Governor Adjustment Details B
R Figure 505



Details of Test Set, Amplifier and PNC Trim Adjustment B
Figure 506

R

CIC 0008/00A



CMB 71 00 00 5 FAYB

Details of Test Set, Amplifier and PNC Trim Adjustment
Figure 506

B

R

R	B	Inter-phone equipment for communications on and around aircraft during ground running	-
R	B	Portable BCF or CO2 Fire Extinguishers	-
R	B	Ground lock, main gear	277387
R	B	Ground lock, nose gear	C22127
R	B	Ground lock, main gear shortening system (2)	748687
R	B	Pin, nose wheel steering neutralising	C22646
R	B	Chocks (nose and main)	-
R	B	"The following covers, bungs, etc. will need to be removed before ground running can commence".	
R	B	Cover, engine intake, No.1.	D936096002
R	B	Cover, engine intake, No.2	D936096000
R	B	Cover, engine intake No. 3	D936096001
R	B	Cover, engine intake, No.4	D936096003
R	B	Cover, engine intake lower lip (4)	D92680600
R	B	Cover, nozzle/exhaust (4)	-
R	B	Covers, pitot head, fuselage (2)	D935044000
R	B	Cover, pitot head, nose probe	E935021000
R	B	Cover, ice detector probe (2)	E935038000
R	B	Cover, vane, yaw (2)	E935040000
R	B	Cover, incidence vane, pitch (2)	E935181000
R	B	Cover, fuel vent ambient sense, tank 11 (2)	E935043000
R	B	Cover, static vent frames 12/13 right	E930004800
R	B	Cover, static vent frames 12/13 left	E930004700
R	B	Cover, static vent, frames 14/15	E930004600
R	B	Cover, static vent	D930709400
R	B	Cover, static vent	D930709500
R	B	Key, for opening M.L.G. doors	734116
R	B	Cover, engine intake, inner (4)	PE12325
R	B	Cover, fuel heater exhaust (for use either in engine bay door or direct into exhaust pipe)	D935152000
R	B	Bung, fuel vent pipe, upper	D935168000
R	B	Bung, fuel vent pipe, lower	D935178000
R	B	Bung, fuel jettison pipe	D935169000
R	B	Bung, air inlet, No.11 tank (2)	D935184000
R	B	Cover, "G" labyrinth bleed (8)	E935018000
R	B	Cover, low speed intake, inboard (2)	E935019100

B	Bung, inner elevon PCU fairing	D935111000
B	Covers, air intake - for short term parking	D924323000
B	Cover, low speed intake, outboard (2)	E935019150
B	Seals, cowl bleed (2) bays 2 and 3	E935053000
B	Cover, main wheel (8)	-
B	Cover, nose wheel (2)	-
B	Ear defenders	BAOD Code
B		GZAD 1300
B	Engine Tools:	
B	Reset and adjuster tool, N2 govern/datum	(2-72-2151-1BA
B		(BA CODE
B		(HWAT 1314
B		
B	Adjusting key, PNC trim	(PE15924 or
B		(BA CODE
B		(HZAK 1298
R		(S3S20516000
B	Tester, jet pipe nozzle indicator	PE 34751
B	position	BA CODE GEES 0811
B	Stop Watch	
B	Checkmor Developer	BAOD CODE MAGC 5255

B NOTE: Minimum acceptable attenuation for ear defenders and intercomm. headsets:

Frequency	HZ	125	250	500	1000	2000	4000	8000
Mean attenuation less standard deviation	dB	7	14	27	29	31	39	33

B All BAOD Standard issues meet the above requirement

B 3. Pre-Ground Running Notes (Ref. Fig.503 and 504)

B A. Air Starting Connections

B Care must be taken when making the air start connection to prevent possible damage to the access door. The approved method, on engine bays 1 and 3 is:

B (1) Press the four Press-to-Open latches in the access door.

B (2) With the access door open, close the latches.

B (3) Hinge the access door fully open.

B (4) Operate the latches in doors 2 and 4 to retain the door fully open.

B B. Quick Attach/Detach Couplings

When an engine is to be ground run initially after installation, the quick attach/detach (QAD) couplings securing the following components must be re-tightened after one half to three hours engine running time, in accordance with 70-00-06, Removal/Installation.

(1) IDG.

(2) First stage fuel pump

(3) Fuel Control unit

(4) Air starter

If the fitting of any one of the above components is disturbed, its attaching QAD coupling must be re-tightened after a similar period.

4. EXTERNAL CHECKS

A. EXTERNAL CHECKS PRIOR TO GROUND RUNNING - ENGINES

(1) Remove the air intake and exhaust covers.

(2) Gain entry into the engine(s) intake(s) and carefully examine the intake for general cleanliness, security of the ramps and ramp seals, spill door and spill door seals, anti-icing mats and intake access panels. Check for loose rivets, screws or debris and for signs of fluid leakage from the ramp actuator and pipelines,

(3) Security of all engine pipes and connections.

(4) Freedom from leaks.

(5) IDG and engine oil leaks satisfactory for ground running.

(6) Engine bay doors open or closed as required.
NOTE:- If the bay doors are to be left open, they must be supported by means of a door strut or screwjack.

(7) Air starter connected to engine 1 or 3 as required.

(8) If the reason for the engine run is because of an engine change, re-heat FCU change or reheat injection system change and a static reheat leak check has not been carried out, proceed as follows.

(a) Ensure fuel tube connections (i) and (ii) listed

below are free from surplus fuel and moisture, i.e. completely dry.

(b) Spray Checkmor liquid developer, BAOD Code MAGC 5255, around the fuel tube connections. Ensure that both fuel tube connections are sufficiently covered with developer to enable any seepage of fuel that might occur during Test 11 to be shown by staining of the developer.

(i) Reheat FCU fuel outlet to reheat fuel supply tube connection.

(ii) Reheat fuel supply tube to reheat spray ring supply tube elbow connection.

B. EXTERNAL CHECKS PRIOR TO GROUND RUNNING - AIRCRAFT

(1) Verify that the landing gear ground locks are fitted.

(a) Three landing gear safety lock pins.

(b) Two landing gear shortening lock jack locking pins.

(c) Landing gear doors locked.

(2) Aircraft correctly positioned on a detuner or forward of a blast wall, whichever is available. If neither of these facilities are available, the aircraft must be positioned in such a way that the engine efflux is not hazardous to personnel or equipment. See EMR 605 or Maintenance Manual (Ref. Fig. 501 and 502) for safety zones.

(3) Nosewheel and main landing gear wheels chocked and correctly secured with chains where applicable.

CAUTION: THE AIRCRAFT BRAKES WILL HOLD THE AIRCRAFT STEADY ONLY BELOW 80% N2 WHEN ALL FOUR ENGINES ARE RUNNING.

(4) Ensure that the aircraft fire protection system is serviceable.

(5) Ensure area of detuner is free from stones or other objects which could damage the aircraft or be ingested by the engines.

(6) Serviceable ground fire bottle in position.

(7) Pre-conditioning air rig connected and running if required.

(8) Personnel Conversant with Safety Precautions and emergency procedures detailed in MM.

(9) Remove all blanks, covers and bungs from the aircraft and ensure that all access panels are secure.

(10) Carry out a visual examination of the aircraft structure for obvious signs of fuel and oil leaks. Pay particular attention to the fuel drain from the dry bay above each engine. The drain outlets are at the front end of each rear engine bay door side panel.

(11) Serviceable head set plugged into the interphone socket at the nose wheel.

5. ENGINE GROUND RUNNING AND START LIMITATIONS

A. ENGINE STARTING LIMITATIONS

(1) Starting with a tail-wind.

Engine starting is not permitted with a tail-wind component greater than 20 knots.

(2) Starting under icing conditions.

The starting and running procedures are affected by low outside air temperature (OAT).

If the OAT is below 3 deg.C during pre-start checks or after starting:

ENGINE ANTI-ICING - Select ON

(3) Operating limitations of air starter.

(a) Maximum duration of cycle (motoring or starting) - 30 seconds

(b) Number and frequency of cycles:

Consecutive cycles - 2 maximum

Waiting period between each group of 2 cycles

Using ground air supply - 10 minutes minimum

Using cross bleed air supply	-	30 minutes minimum
(c) Maximum speed during motoring cycle	-	16% N_2 (engine speed)
(d) Starting Air Supply Pressure	-	29 psig minimum
	-	35 psig maximum
Temperature	-	300 deg.C maximum

B. ENGINE RUNNING LIMITATIONS

(1) Do not exceed the T/O ratings for the given ambient conditions. These are listed in tables ref. (Ref. Fig.507).

CAUTION: DO NOT SELECT CONTINGENCY RATING FOR ANY REASON WHILST THE ENGINE IS AT T/O POWER.

(2) In order to minimise LP Compressor blade vibration, engine ground running in the range 88 to 931 N_1 must be transient only.

(3) No.4 engine must not be operated above 90% N_2 for more than 30 seconds with the N_1 limiter switch selected to 88%. After operation in this manner, a cooling period of at least 5 minutes at idle must elapse before a second operation above 90% N_2.

R (4) Extended high power single engine ground running is
R permitted for the sole purpose of trouble shooting of
R high oil consumption problems, with the engine bay
R doors locked in the open position. A maximum of 10
R minutes duration at 100% N_2 engine speed is permitted,
R subject to the additional limitations for this con-
R dition (Ref.79-00-06).

(5) Multiple engine running (forward thrust).

Engine running at maximum power, dry or reheat, should not be undertaken on more than one engine on the same side, or on all four engines simultaneously, this will limit the maximum load placed on the landing gear and tethering system. Engine running at high power must be kept to a minimum. The engine must not be operated continuously above 93% N_1 for more than one and a half minutes. Three operations are allowed with a minimum cooling period of one minute at Idle between. After three operations, a cooling period of at least five minutes must elapse with the throttle levers at idle, before a further operation above 93% N_1 is carried out. After this operation, the engine must either be shut-down or run at idle for 13 minutes before the complete sequence of events can again be started.

(6) Reverse Thrust

(a) Ground tests of the thrust reversal system are carried out during taxying.

(7) Operation in debow mode.

(a) Operation in debow mode (except under icing conditions).

Maximum speed: 32% N_2
Maximum:
On pre S.B.OL.593-72-8525-188 standard engines - 3 minutes continuous operation to avoid high oil consumption and hiding.

On S.B.OL.593-72-8525-188 standard engines - up to 1 hour continuous.

(b) Operation in debow mode under icing conditions.

The engine must not be held at the debow condition for more than one minute when icing conditions prevail. Icing conditions for debow are when ambient temperature is below 3°C and visibility is less than 1000 metres.

(8) Oil temperature.

(a) Minimum for starting - Minus 35°C

(b) Minimum before advancing the throttle - Minus 20°C

(c) Maximum continuous - 190°C

(d) Maximum - 195°C

(e) Maximum time in range 190°C - 195°C - 5 minutes

(9) Oil Pressure.

(a) On engine to pre Mod M 45188, S.B.OL.593-72-8562 standard.
Minimum acceptable - 18 psig

(b) On engines to Mod M 45188, S.B.OL.593-72-8562 standard.
Minimum acceptable - 10 psig

(10) Fuel Temperature.

(a) Minimum for starting - Minus 40°C

(b) Minimum before advancing throttle - Minus 20°C

(c) Maximum continuous - 150°C

(d) Maximum - 170°C

(e) Maximum time in the range 150°C to 170°C - 2 minutes

(11) Fuel Pressure.

(a) Minimum at engine inlet - 12.5 psia

(b) Maximum fuel filter differential - 7 psi

NOTE: If the limitations (9)(c) and (10)(a) and (b) are exceeded a warning light operates. The values quoted are the nominal settings of the warning light system.

RB (12) On completion of engine running, record in the Tech
RB Log quantities of fuel used and fuel remaining.

R 6. COCKPIT CHECK LISTS
R B A. Safety Check List

R	B	(1)	Ground Service sw.	ON
R	B	(2)	Boarding, Racking area and roof lts.	ON
R	B	(3)	L/gear standby lowering lever	GUARDED
R	B	(4)	Transponder	STBY
R	B	(5)	Radar	OFF
R	B	(6)	Emergency nose/visor uplock release	DOWN/Pin engaged
R	B	(7)	Nose and Visor standby control	OFF/guarded
R	B	(8)	L/gear normal lever	DOWN
R	B	(9)	Gear o/ride	GUARDED
R	B	(10)	Visor/Nose lever	As configur- ation
R	B	(11)	Auto ignition sws.	OFF
R	B	(12)	ADS/Engine probe heaters	OFF
R	B	(13)	Wing intake anti-icing test	OFF
R	B	(14)	Fuel fwd trans sw.	GUARDED
R	B	(15)	Trim trans auto master sel	OFF/Guarded
R	B	(16)	Fuel tank trim inlet valves - Main & Override	Auto/OFF
R	B	(17)	Standby inlet valves sws	SHUT
R	B	(18)	Trim pipe drain sw	SHUT
R	B	(19)	Jettison panel covers	CLOSED
R	B	(20)	Ram Air turbine sels	GUARDED
R	B	(21)	Circuit breakers	All set
R	B	(22)	Ground power	On

(23) Equipment bay cooling — Chkd./Set - See App.A page 564

NOTE: In order to keep Flight Deck Temperatures as low as possible with ground power connected and no pre-conditioned air supply connected, keep the cabin and flight deck as well ventilated as possible.

TABLE 2 - PERMITTED FLIGHT DECK PERSONNEL AND RESPONSIBILITIES

Location	Left Seat	Engineers Seat	Right seat/ 1st observer
Personnel	Co-ordinator/Recorder*	Engineer in Charge	Observer/ Recorder*
Qualification	Type Experience	Airframe/Engine Approval 1) Documentation complete 2) A/C Positioned IAW Maintenance Manual and EMR. 605, 650 3) External and Flight Deck checks complete	
	Establish VHF control Establish ground contact		
Engine Start		Obtain ground clearance and call for air Check pneumatic conditions	
	Monitor N2 gauge and check for N2 rise	Put start/relight selector to start and check that start valve MI shows open and start pump caption illuminated. Check that debow s/w extinguished.	

Location	Left Seat	Engineers Seat	Right seat/ 1st observer
Personnel	Co-ordinator/Recorder*	Engineer in Charge	Observer/ Recorder*
Engine start (Continued)	Announce when N2 is between 10-12% and open HP valve. Check MI shows open. Start clock and check that light-up has occurred within 8 secs. Monitor rate of increase of EGT and make sure EGT does not exceed 450°C. When relight/ start selector re turns to off position restart clock. Monitor for failure of EGT signal to ECU. Check that engine stabilises at debow speed. Announce when 60 secs has elapsed. Check that engine accelerates to 67% N2 root theta and then back to 65% N2 root theta.	tinguished. When HP is opened check that IGN captions illuminate. Check that by 20-25 % N2 oil pressure warning has disappeared and that at, 25% N2 the start/ relight selector returns to off position. Announce when this happens. Check start valve MI shows shut and that IGN captions are extinguished. Check that after 60 secs has elapsed the debow s/w toggle light extinguished. Check that start pump captions extinguish.	

*If three persons available, person in right hand seat acts as recorder.

During run procedure	Maintains VHF and Ground contact. Holds steering tiller central. Monitor for failure of EGT signal to ECU.	Ensure electrical, pneumatic and hydraulic power sources are maintained as necessary. Operates engine and systems as detailed in Run sheets.	Details run sequence and makes recordings on engine run sheet

Location	Left Seat	Engineers Seat	Right seat/ 1st observer
Personnel	Co-ordinator/Recorder*	Engineer in Charge	Observer/ Recorder*
		Detail adjustments to engine. Operates HP cock/Eng. Shut down handle as required.	
Engine Fire	Informs ground crew. Informs contact on VHF and request assistance, irrespective of bay doors being open or closed.	Pulls engine shut down handle and proceeds with fire drill depending on engine bay doors open or closed. Shuts down remaining engines. Completes shut down checks.	
Unexpected engine red warnings i.e. steady red in Eng. shut down handle.	Informs ground crew.	Retards engine thrust lever to idle. Pull engine shut down handle and carry out shut down procedure listed in Abnormal Procedures. Determine condition of engine and reset engine shut down handle if safe to do so.	
Double ECU lane failure	Informs ground crew.	Shut HP Valve. Check HP Valve indicates shut. No shut indicated - Pull engine shut down handle. Auto Ignition selected off. Reheat s/w-ensure off.	

Location	Left Seat	Engineers Seat	Right seat/ 1st observer
Personnel	Co-ordinator/Recorder*	Engineer in Charge	Observer/ Recorder*
Engine surge	Monitors EGT and announces if EGT exceeds 800°C.	Retards engine thrust lever to idle. If surging continues or EGT has risen above 800°C, shut HP valve.	

CAUTION: FOR REMAINDER OF ABNORMAL PROCEDURES GROUND RUN MANUAL TEST. FOR ABNORMAL PROCEDURES NOT LISTED HERE, IT IS THE RESPONSIBILITY OF THE ENGINEER IN CHARGE TO CARRY OUT THE PROCEDURE.

B. COCKPIT PREPARATION CHECK LIST

(1) Interphone - Pilots roof panel CABIN
G-BOAG-Interphone switch on pilots roof panel not fitted.

(2) Servo control panel Selectors NORMAL

(3) Throttle masters MAIN or ALTERN

(4) Engine rating TAKE-OFF

(5) HP Valves SHUT

(6) Engine anti-icing OFF

(7) Engine shut down handles IN

(8) 1st and 2nd Shot Discs intact

(9) Master warning (lights test) Check

(10) Landing gear indications 4 greens

(11) Brakes Park

B	(12)	Brake pressures	Checked
B B B	(13)	Primary engine indicators	Flags clear and Sensible readings
B	(14)	Throttles	IDLE
B	(15)	Reheat selectors	OFF
B B	(16)	Throttle lights	Press to test-MWS & GONG
B	(17)	ADCs	ON
B	(18)	Start/relight selectors	OFF
B	(19)	Engine Debow switches	NORMAL
B	(20)	Ignition selector	LH. RH or BOTH
B	(21)	Emerg. relight busbars selector	OFF
B	(22)	Fire sensors	BOTH
B	(23)	Flame sensors	BOTH
B	(24)	Intake test master switch	GUARDED
B	(25)	Reset test switch	RESET
B	(26)	Limit rest Pb.	PRESS
B B	(27)	Interphone - 3rd Crew member's panel	GROUND
B RB B B B	(28)	Audio Selector panel G-BOAG Audio Selector Panel -	Intercomm. selected Sel OUT & INT Selectors Adjust Vol. by Rotation INT/RADIO S/W to INT
B B	(29)	Nozzle air SOV and wind down test	OFF
RB B	(30)	Fire and Nacelle O/Heat	Test. See App. A para 3
RB B	(31)	Eng. O/Heat	Test. See App. A para 4

RB B	(32)	Fire Ext. pressure cartridge	Check. See App. A para 5
RB	(33)	Smoke Detection	Check. See App. A para 7
	(34)	Air intakes, ramp/spill master switches	MAN
	(35)	Ramps	Fully up
	(36)	Spill doors	Closed
	(37)	Cabin pressure control, emergy. Depress, selector	NORM & GUARDED
	(38)	Engine Warning Lights	All off
	(39)	Fuel Filter Captions	Press to test - MWS and GONG
	(40)	Fuel Heaters	AUTO
	(41)	Engine recirculation valves	SHUT
	(42)	Engine 4 T/O N1 limiter switch	NORM
	(43)	Grd. idle switches	HI
	(44)	Engine control schedule	NORMAL and AUTO
	(45)	Secondary air door (in auto)	SHUT
	(46)	Flight rev arm	Off
	(47)	Secondary engine instruments	Check
	(48)	Cancelled	
	(49)	Bleed Valves	OPEN
	(50)	Cross bleed valves	SHUT
	(51)	Cond valves	OFF
	(52)	Fuel valves	AUTO and GUARDED
	(53)	Temp control transfer switches	GUARDED
	(54)	Temperature selectors	NORMAL

B	(55)	Fuel pumps	All OFF
B B	(56)	Fuel valves - Interconnect and transfer	SHUT
B	(57)	LP valves	OPEN
B	(58)	Hydraulic pump selectors	OFF/AUTO
B	(59)	Emergency generator	AUTO
B	(60)	Generator selectors	ON
B B B		<u>NOTE</u>: If reason for engine run is engine change or IDG change select Generator ... OFF	
B B B B	(61)	VHF	Set Company frequency/ Control Tower frequency London-Company frequency = 131.9 MHz
B	(62)	Zero fuel CG	Set 55.2%
B	(63)	Zero fuel weight	Set 80,000 Kgs
B B B B		<u>NOTE</u>: For prolonged engine running it may be necessary to transfer fuel into the collector tanks. With the above zero fuel CG and zero fuel weight set <u>DO NOT EXCEED 54% CG</u>.	
B B		The minimum quantity in tank 9 should be 4000 Kgs.	
B B B		If the engine run is to take place with the fwd pax door shut, the escape slide should be put in the armed position.	
RB RB RB RB	(64)	AIDS on line	Reset CB 2-213, G19 (system will start when first aircraft generator comes on line)

7. ENGINE RUN DATA RECORDING SHEET

Referenced Datums

Ambient pressure QFE (or QNH and Airfield ALT)	mb
Ambient temp - T1	°C
Target N2 for PNC Trimming (Ref.Fig.509)	%
Required nozzle trim angle Table 3 page 545	0
N2 for Slam accel. (Ref.Fig.507)	%
Target N2 required for performance check (Ref.Fig.508)	%

NOTE: London Met. Freq = 121.85 MHz

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		Test	Parameter	Eng. No.1	Eng. No.2	Eng. No.3	Eng. No.4
RB	13)	LPOG check	N2 Dip experienced				
RB	17)	Oil pressure	Oil pressure PSIG				
RB	18)	Acceleration check	Accel. Time Secs. Main T/O N2 achieved Amplifier				
			Accel. Time Secs. Alt. T/O N2 achieved Amplified				
RB	19)	Stabilised Idle	N2 - Main Fe Kg/hr Amplifier				
			N2 - Alt. Fe Kg/hr Amplifier				
RB	20)	Performance Check	N2 N1 Fe				

	Test	Parameter	Eng. No.1	Eng. No.2	Eng. No.3	Eng. No.4
		EGT AJ P7 Oil pressure Oil temp. T.C.A.				
RB	24) Run down times	N2 N1				

8. PRE-START CHECKS

A. Procedure

(1) Throttle Master - Main

CAUTION: IF ALTERNATE LANE IS USED AND THE ADJACENT ENGINE IS NOT RUNNING THE ENGINE CONDITION MUST BE CAREFULLY MONITORED TO ENSURE THAT THE LIMITATIONS WITH REGARD TO EGT AND ROTATING STALL CLEARANCE SPEED ARE NOT EXCEEDED.

THE ALTERNATE LANE TAKES ITS T1 SIGNAL FROM THE ADJACENT ENGINE AND IF THE ENGINE IS NOT RUNNING, THIS SIGNAL MAY BE IN ERROR. IF POSSIBLE, THE ADJACENT ENGINE SHOULD BE RUN TO GIVE AN AIRFLOW OVER THE T1 PROBE.

IF THE ENGINE OIL TEMPERATURE IS BELOW THE MINIMUM FOR STARTING, BUT NOT LOWER THAN THE MINIMUM FOR MOTORING, THEN A DRY MOTORING CYCLE SHOULD FIRST BE CARRIED OUT. FOLLOWING THE COMPLETION OF THE MOTORING CYCLE AND PROVIDED THAT THE ENGINE OIL TEMPERATURE IS NOW NOT BELOW THE STARTING LIMIT, AN ATTEMPT MAY BE MADE WITHIN THE LIMITATIONS OF THE AIR STARTER OPERATION.

(2) Engine Anti-ice - ON if OAT 3°C or less

(3)	Auto stab.1 & 2 artificial feel 1 & 2 & electrical trim 1 & 2	- OFF
(4)	Ground Hyd Check-out pump s/w's Allow 3 secs between starting each pump	- ON
(5)	Ground Hyd check-out selector	- Yellow/Yellow (Yellow system pressure 3500 psi)
(6)	Pump s/w's	- OFF
(7)	Anti-coln. s/w's	- ON
(8)	Nav. Lights	- As required
(9)	Battery Selectors	- ON
(10)	Door Captions	- As required
(11)	Ground Clearance	- Given
(12)	VHF Contact	- Made and listening watch asked for
(13)	Engine feed pump for engines to be started (Main)	- ON - OFF - if dry cycle is to be carried out before start
(14)	Debow s/w for engines to be started/cycled	- DEBOW

Start Eng Pos	1	2	3	4
Eng S/N				

R 9. ENGINE RUN TESTS

CAUTION: ENSURE COCKPIT SAFETY AND PREPARATION CHECK LISTS CARRIED OUT BEFORE ENGINE RUN TESTS STARTED

Test No.1 - DRY MOTORING CYCLE - GROUND AIR SUPPLY

A. Procedure

(1)	Engine Feed Pumps	- Ensure OFF
(2)	Throttle master	- MAIN
(3)	Hydraulic Reservoir Air Low Pressure Warning Light(s)	- Check extinguished - If not extinguished run air compressor
(4)	If engines 1 or 2 to be cycled	- Select servo control top rotary selector to blue only
(5)	If engines 3 or 4 to be cycled	- Select Servo control top rotary selector to green only
(6)	Hydraulic Pump(s) selectors for engines to be cycled	- ON/AUTO
(7)	Debow s/w for engines to be cycled	- DEBOW
(8)	Igniter Control s/w	- OFF
(9)	Auto ignition s/w	- OFF
(10)	C.B.'s - LH Ignition Supply	- TRIP
	RH Ignition Supply	- TRIP
	Start pump supply Phase A	- TRIP
	Start pump supply Phase B	- TRIP
	Start pump supply Phase C	- TRIP
(11)	Ground air supply check for supply pressure	
(12)	Cross-bleed s/w	- Select OPEN Check pressure - 20-35 PSI
(13)	Cross-bleed s/w	- Select CLOSED
(14)	Relight/start s/w	- Select START
(15)	Engine Debow s/w light Check N2 rises	- Extinguishes
(16)	IGN Captions	- Check both OUT

(17) Start Pump Caption - Check remains OUT

(18) Start Valve MI - OPEN
Do not exceed 16% N2 - Check for Fuel Oil, Hydraulic and Air Leaks 30 seconds after selecting Start

(19) If air conditioning primary or secondary heat exchanger has been replaced or refitted. Leak test ductjoints to M.M.21-12-11 or 21-12-14 p.501-3. Ignore paras 2B(1) and (2), Preparation.

(20) Engine debow - Select NORMAL

(21) Relight/Start s/w - Should unlatch - if not select

(22) Start Valve MI - Check SHUT

(23) Servo Control Panel Rotary Selectors - NORMAL

(24) Hydraulic Pump Selectors - OFF/AUTO

(25) CBs -

LH Ignition Supply	RESET	AFTER AT LEAST 30 SECONDS HAVE ELAPSED SINCE DEBOW SWITCH PUT TO NORMAL
RH Ignition Supply	RESET	
Start Pump Supply Phase A	RESET	
Start Pump Supply Phase B	RESET	
Start Pump Supply Phase C	RESET	

(26) Recheck IDG and engine oil levels and replenish as necessary.

CAUTION: ENGINE COCKPIT SAFETY AND PREPARATION CHECK LISTS CARRIED OUT BEFORE ENGINE RUN TESTS STARTED.

TEST NO.2 - WET MOTORING CYCLE - GROUND AIR SUPPLY

A. Procedure

CAUTION: A WET MOTORING CYCLE MUST NOT BE CARRIED OUT USING CROSS-BLEED FROM ADJACENT ENGINE.

NOTE: Place container beneath drains outlet to catch fuel.

(1) Engine Feed Pumps - ON

(2) Throttle Master - MAIN

B	(3)	Debow s/w for engine to be cycled	- DEBOW
B	(4)	Igniter Control s/w	- OFF
B	(5)	Auto Ignition s/w	- OFF
B	(6)	CB's - LH Ignition Supply	- TRIP
		RH Ignition Supply	- TRIP
B	(7)	Ground air supply check of supply pressure	
B	(8)	Cross-bleed s/w	- Select OPEN - Check pressure 29-35 psi
B	(9)	Cross-bleed s/w	- Select CLOSED
B	(10)	Relight/Start s/w	- Select START
B	(11)	Engine Debow s/w light Check N2 rises	- Extinguishes
B	(12)	IGN Captions	- Check both OUT
B	(13)	Start Pump Captions	- Illuminates
B	(14)	Start Valve MI At 10-12% N2	- OPEN
B	(15)	HP Valve s/w	- Select OPEN
B	(16)	HP Valve MI	- Check OPEN
R B		Do not exceed 16% N2	
B	(17)	30 secs after selecting Start or earlier if satisfactory fuel discharge is seen at the exhaust	
B		(a) HP Valve s/w	- Select SHUT
B		(b) HP Valve MI	- Check SHUT
B		(c) Engine Debow s/w	- Select NORMAL
B		(d) Relight/Start s/w	- Should UNLATCH
B		(e) Start Valve MI	- Check SHUT
B		(f) Start Pump Caption	- Will remain illuminated for further 30 secs.

<u>CAUTION</u>: DO NOT SELECT ENGINE DEBOW S/W TO DEBOW WITHIN 1 MINUTE OF SELECTING RELIGHT/ START S/W OFF.

R B (g) CB's - LH Ignition Supply - RESET After Start Pump
R B
R B RH Ignition Supply - RESET Caption has extinguished
R B

R B **CAUTION:** ENSURE COCKPIT SAFETY AND PREPARATION CHECK LISTS
R B CARRIED OUT BEFORE ENGINE RUN TESTS STARTED.

R B **TEST NO.3 DEPRESERVE ENGINE FUEL SYSTEM AND CHECK OF ENGINE AND**
R B **I.D.G. OIL LEVELS**

R B **CAUTION:** A WET MOTORING CYCLE MUST NOT BE CARRIED OUT USING
R B CROSS-BLEED FROM ADJACENT ENGINE.

R B **NOTE:** Place container beneath drains outlet to catch fuel

R B A. Procedure

R B (1) Engine Feed Pumps - ON

R B (2) Throttle Master - MAIN

R B (3) Hydraulic Reservoir Air Low Pressure Warning Light(s) - Check Extinguished - If not extinguished run compressor
R B
R B

R B (4) If engines 1 or 2 to be cycled - Select Servo Control Top rotary selector to blue only
R B

R B (5) If engines 3 or 4 to be cycled - Select Servo Control top rotary selector to green only
R B

R B (6) Hydraulic Pump(s) selector for engines to be cycled - ON/AUTO
R B
R B

R B (7) Debow s/w for engines to be cycled - DEBOW
R B

R B (8) Ignitor control s/w - OFF

R B (9) Auto ignition s/w - OFF

R B (10) CB's - LH Ignition Supply - TRIP
R B
R B RH Ignition Supply - TRIP
R B

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R B (11) Check ground air supply
R B pressure

R B (a) Cross bleed s/w - Select OPEN check pressure 29-35 p.s.i.

R B (b) Cross bleed s/w - Select CLOSED

R B (c) Relight/start s/w - Select START

R B (d) Engine debow s/w - Extinguishes
R B light check N2 rises

R B (e) IGN Captions - Check both OUT

R B (f) Start pump captions - Illuminate

LEFT BLANK INTENTIONALLY

R B (g) Start valve MI — OPEN

R B (12) At 10-12% N2

R B (a) HP Valve s/w — Select OPEN

R B (b) HP Valve M.1 — Check OPEN

R B (13) Do not exceed 16% N2

R B Upon fuel flow indication

R B (a) HP Valve s/w — Select CLOSED

R B (b) HP Valve MI — Check CLOSED

R B (14) 30 secs. after selecting start

R B (a) Engine Debow s/w — Select NORMAL

R B (b) Relight/Start s/w — Should UNLATCH

R B (c) Start pump caption — Will remain illuminated
R B for further 30 secs.

R B (15) Servo Control Panel — NORMAL
R B rotary selectors

R B (16) Hydraulic Pump selectors — OFF/AUTO

R B (17) CBS - LH Ignition Supply — RESET After Start Pump
R B RH Ignition Supply — RESET Caption has
R B extinguished

R B (18) Recheck IDG and engine — Replenish as necessary
R B oil levels

R CAUTION: ENSURE COCKPIT SAFETY AND PREPARATION CHECK LISTS CARRIED
R OUT BEFORE ENGINE RUN TESTS STARTED.

R <u>TEST NO. 4 NORMAL ENGINE START</u>

R B A. See Possible Engine Start problems

R B B. Carry out Pre-start Checks

R B C. If the reason for the engine run is an engine installation
R B run or IDG change, carry out the following:-

R B (1) Generator S/W - OFF

R	B	(2)	Generator M.I.	- Cross line
R	B	(3)	Generator Caption	- Illuminated
R	B	(4)	Engine Feed Pumps	- ON
R	B	(5)	Ignition rotary selector	- BOTH
R	B	(6)	Debow switch	- Select DEBOW
R R	B B	(7)	Check ground air supply pressure	
R R	B B	(8)	Cross bleed S/W	- Select OPEN - check - pressure 29-35 psi
R	B	(9)	Cross bleed s/w	- Select CLOSED
R	B	(10)	Relight/Start s/w	- Select START
R	B	(11)	Engine Debow S/W light	- Extinguished
R R	B B	(12)	Start Valve M.I.check that N2 rises	- OPEN
R R	B B	(13)	Start Pump caption At 10-12% N2	- Illuminates
R	B	(14)	HP Valve S/W	- Select OPEN
R	B	(15)	HP Valve M.I.	- Check OPEN
R	B	(16)	Clock	- START
R R	B B	(17)	IGN Captions	- Illuminated as per selection

R Check that 20-25% N2 low oil pressure warning has disappeared. If
R not, shut down engine on HP Valve. Check EGT increases and monitor
R rate of increase. Light up should occur within 8 secs.

R If EGT does not increase or threatens to rise above 450°C, shut
R down engine on HP Valve.

R B D. At 25% N2

R B (1) Start/Relight Selector - Check returns OFF, if not
R B select OFF

R B (2) Clock - START

R B (3) Start Valve M.I. - SHUT - If not request
R B manual shut

R B (4) Ign. Captions - OUT

R B (5) N2 - Check stablised at 30% N2

R B (6) Record Debow N2 Speed - If not stabilised by 32% N2
Shut-down engine on HP valve

R B (7) Engine Debow S/W Lite - Illuminates or 1 min. after
R B start/relight selector
R B returned to OFF

R B (8) Engine Debow S/W - Select normal
R B N2 should increase to 67% N2
R B root theta and then return
R B to 65% N2 root theta

R B (9) Engine Debow S/W Light - Extinguished

R B (10) Throttle Lever - IDLE for 1 min

R B (11) Start Pump Caption - OFF - 30 secs after debow
R B s/w selected NORMAL

R B (12) CSD Caption - OFF

R B (13) Generators - IF ON LINE - Check output and
R B - temperatures

R B (14) Engine driven hydraulic - Select ON - Check pressure,
R B pumps temperature and quantity
R B satisfactory

R B (15) Ignition rotary selector- OFF

R B (16) Scan instruments and ensure all indications are normal

E. AFTER START CHECKS

(1) Throttle Master S/W - Select alternate lane and check that "Throt" Caption remains OFF

CAUTION: IF ALTERNATIVE LANE USED FOR ANY PERIOD OF TIME, OBSERVE CAUTIONS STATED AT BEGINNING OF PRE-START CHECKS.

(2) Auto Ignition - OFF

(3) Fuel Temperature - If fuel temperature at manifold falls below 20°C fuel heat may be selected 'ON' if required

(4) ADS/Engine Probe Heaters

(a) Selectors - Tt inhib

(b) STBY S/W - ON

(c) ADS/Engine Probe Heater Captions (Tt) - OFF - Note At Tt inhib the Tt Captions will be illuminated if the OAT is less than 15°C

(5) Air conditioning - Select Open

NOTE: Con. valves take 30 secs. to move from Open to Closed position. With Con valve open, Jet Pump M.I.s should be in line and flow 0.25 Kg/Sec. approx at Idle

(6) Aux. inlet M.I.s - OPEN

(7) Secondary Nozzle - 21° - 9° + 5°

(8) ACC Captions - Off

(9) CSD oil o/heat Captions - Off

(10) CSD oil diff. temp. - Diff. 15° Approx.

(11) CSD oil inlet temp. - Inlet 80°C

(12) Engine o/heat - Carry out test at TCA, A, B, C, D See Appendix A page 565

RB (13) G-BOAG only - Batteries - NORMAL

TEST NO.5 - CROSS BLEED START

A. See possible engine start problems

B. Carry out Pre-start Checks

C. If the reason for the engine run is an engine installation run or IDG change, carry out the following:

(1)	Generator s/w	- OFF
(2)	Generator MI	- Cross line
(3)	Generator Caption	- Illuminated
(4)	Engine Feed Pumps	- ON
(5)	Ignition Rotary Selector	- BOTH
(6)	Engine Debow s/w	- Select DEBOW
(7)	Cross-bleed switch on engine to be started	- Select CLOSED
(8)	Adjacent Engine	- Running
	(a) Bleed Valve	- Select OPEN
	(b) Cross Bleed Valve	- Select OPEN
	(c) Throttle Lever	- Adjust to obtain between 29 and 35 psig duct pressure
(9)	Relight/Start s/w	- Select START
(10)	Engine Debow s/w light	= Extinguished
(11)	Start Valve MI Check that N2 rises	- OPEN
(12)	Start Pump caption At 10-12% N2	- illuminates
(13)	HP Valve s/w	- Select OPEN
(14)	HP Valve MI	- Check OPEN
(15)	Clock	- START

(16) IGN Captions - Illuminated as per selection

Check that 20-25% N2 low oil pressure warning has disappeared. If not, shut down engine on HP valve. Check EGT increase and monitor rate of increase. Light up should occur within 8 secs.
If EGT does not increase or threatens to rise above 450°C, shut down engine on HP valve.

D. At 25% N2

(1) Start/Relight selector - Check returns OFF, if not select OFF

(2) Clock - START

(3) Start Valve MI - SHUT - If not request manual shut

(4) IGN Captions - OUT

(5) N2 - Check stabilised at 30% N2

(6) Record Debow N2 speed - If not stabilised by 32% N2 shut down engine on HP Valve

(7) Adjacent engine

(a) Throttle - Set IDLE

(b) Cross bleed Valve - Select SHUT

(c) Bleed Valve - OPEN

(8) Engine Debow s/w light - Illuminates or 1 min after start/relight selector returned to OFF

(9) Engine Debow s/w - Select NORMAL
- N2 should increase to 67% N1/root theta and then return to 65% N2 root theta

(10) Engine Debow s/w Light - Extinguished

(11) Throttle Lever - IDLE for 1 min

(12)	Start Pump caption	- OFF - 30 secs after engine debow s/w selected Normal
(13)	CSD caption	- OFF
(14)	Generators - if on line	- Check output and temperatures
(15)	Engine driven hydraulic pumps	- Select ON - Check pressure temperature & quantity satisfactory
(16)	Ignition rotary selector	- OFF

(17) Scan instruments and ensure all indications are normal

AFTER START CHECKS

(1)	Throttle Master s/w	- Select alternate lane and check that "Throt" caption remains OFF.

CAUTION: IF ALTERNATIVE LANE USED FOR ANY PERIOD OF TIME OBSERVE CAUTIONS STATED AT BEGINNING OF PRE-START CHECKS.

(2)	Auto Ignition	- OFF
(3)	Fuel Temperature	- If fuel temperature at manifold falls below 20°C, fuel heat may be selected 'ON' if required.

(4) ADS/Engine Probe Heaters

(a)	Selectors	- Tt inhib
(b)	STBY s/w	- ON
(c)	ADS/Engine Probe Heater Captions (Tt)	- OFF - NOTE at Tt inhib - Tt captions will be illuminated if the OAT is less than 15°C

(5)	Air Conditioning	- Select 'OPEN'

NOTE: Con. valves take 30 secs to move from Open to Closed position. With Con. valve open, Jet Pump MIs should be in line and flow 0.25 Kg/ sec approx at Idle

B	(6)	Aux. inlet MIs	- OPEN
B B	(7)	Secondary nozzle	- 21° - 9° + 5°
B	(8)	ACC Captions	- OFF
B	(9)	CSD oil o/heat Captions	- OFF
B	(10)	CSD oil diff. temp.	- Diff. 15°C Approx
B	(11)	CSD oil inlet temp.	- Inlet 80° Approx
B B B RB	(12)	Engine o/heat	- Carry out test at TCA, - A, B, C, D & No. 4 - bearing test. See - Appendix (A) - Para 1

R TEST NO.6 - AIR CONDITIONING BLEED VALVE OVERPRESSURE CHECK

A. Procedure

(1) Throttle lever - IDLE

(2) Bleed Valve - OPEN

(3) Conditioning Valve - ON - transit time - 30 secs.

(4) Overpressure Caption - Press

Bleed Valve should close and caption should illuminate Amber AIR MWS AND GONG

(5) Bleed Valve M.I. - Cross Line

(6) Overpressure Caption - RELEASE

Bleed Valve opens and system restored to normal configuration

(7) Bleed Valve M.I. - In line

(8) Conditioning Valve - ON

R <u>TEST NO.7 - HYDRAULIC PUMP DEPRESSURIZATION CHECK</u>

A. To be carried out after engine change or pump change

B. Procedure

(1) Throttle lever - IDLE

IF RUNNING MORE THAN ONE ENGINE - NOTE

As each hydraulic system is supplied by two pumps, in order to observe the fall in system pressure required below, it may be necessary to depressurize the other pump supplying the system if more than one engine is running.

(2) To depressurize a blue or green system pump
Select pump S/W to - OFF

(3) To depressurize a yellow system pump
Set the yellow pumps,
NORM/MAN S/W to - MAN
Then select pump S/W to - AUTO

(4) Hydraulic Pump S/W for Pump under test - ON - System pressure 4000 psi

(5) L/Press Caption for pump under test - Press system pressure should fall to zero (slowly)
Caption should illuminate plus Amber HYD MWS and Audio gong

(6) L/Press Caption - Release - system pressure should return to 4000 psi and system restored to normal configuration

<u>NOTE:</u> For engines 2 & 4 the test will have to be repeated on the yellow system pumps.

(7) After Test, restore hydraulic system to normal

(a) Pump s/ws - ON/AUTO

(b) Yellow system NORM/ MAN pump s/w - NORM

R TEST NO.8 - IDG OPERATIONAL TEST

To be carried out after engine installation or IDG change.

A. Procedure

The IDG should be "Off" line as selected in Test No.4

(1) Hold generator control s/w to "TEST" and check

(a) M.I. remains cross line

(b) 'GEN' Caption remains illuminated

(c) Select AC FREQ/VOLTS selector to appropriate generator and check that output is 115V ± 3/5 volts approx 400 Hz

(2) Select Generator Control S/W "ON" and check

(a) M.I. in line

(b) 'GEN' Caption extinguished

(c) All AC MAIN BUS and AC ESS BUS Captions extinguished. All M.I.s. in line except as noted above

(3) Apply a load of 40-50 kw and check for correct output as in 1c.

(4) Allow the IDG to run for 10 minutes to stabilize. Oil temps, inlet 80°C, diff. 15°C approx.

NOTE: If the frequency is erratic then the IDG must be changed

(5) (a) Check frequency is between 396 and 404 Hz. If frequency is incorrect, then IDG to be adjusted IAW MM 24-11-00

(b) Generator Control S/W to "TEST", check frequency as 5.a)

(c) Generator Control S/W to OFF/ON as required

R TEST NO.9 - LEAK CHECK AT IDLE POWER

A. Procedure

WARNING: APPROACH ENGINE FROM SIDE. TAKE CARE TO AVOID INTAKE AND SPILL DOOR SUCTION AREAS AND THE ENGINE HOT AND COLD VENTS. FUEL HEAT MUST BE IN THE OFF POSITION.

(1) Engine Bay Doors Open

(2) Throttle lever - Idle

(3) Engine Leak Check - doors open

(a) Inspect the installation for excessive fuel spills, paying particular attention to all fuel tube connections, fuel drain tubes and especially the fuel overboard vent just fwd of the drains tank. NO fuel should be seen coming from the fuel overboard drain whilst the engine is running.

NOTE: Pay particular attention to the fuel systems if no static leak check has been carried out on the engine prior to installation or ground running.

(b) Inspect the installation for oil leakage paying particular attention to replenishment points, filters, drain plugs and hydraulic pipe connections.

(c) Inspect the installation for air leakage paying particular attention to the engine break points in the air system.

(d) Inspect the turbine and the exhaust system for gas leakage paying particular attention to the jet pipe joints.

(4) Engine leak check - doors open or closed.

(a) Check that there is no leakage from the over-board spill outlets.

R **TEST NO.10 - ENGINE OVERHEAT AND TCA FAILURE**

R (1) With the throttle lever at the idle position, check
R that the engine is at steady idle rmp.

R (2) (a) Turning in a clockwise direction, select ENG
R O/HEAT TEST switch to each test position in
R turn.

R (b) Master warning light indications (including
R engine shut-down handle) illuminate for all
R the channel positions.

R (c) The overheat warning light should illuminate
R at each position and extinguish when switch
R is between test positions where a reset cancels
R the warnings.

R <u>NOTE:</u> If failure warnings lights fail to
R extinguish when test position is
R changed or when the selector switch is
R returned to OFF, stop the engine and
R investigate defect.

R (d) TCA - Check TCA TEMP W/L (RED)
R illuminated and gauge
R needle deflects

R (e) O/HEAT A - Check ENGINE O/HEAT caption
R (RED) illuminated

R (f) O/HEAT B - Check ENGINE O/HEAT caption
R (RED) illuminated

R (g) O/HEAT C - Check ENGINE O/HEAT caption
R (RED) illuminated

R (h) O/HEAT D - Check ENGINE O/HEAT caption
R (RED) illuminated

R (j) O/HEAT TEST switch - Select OFF

R (3) Return ENG O/HEAT TEST switch in reverse direction
R to OFF position. Warning lights should extinguish.

R (4) If ENG O/HEAT or TCA light fails to illuminate, repeat
R checks at a higher value of N_2, not greater than 85%.

R (5) If lights again fail to illuminate, check lamp
R filament, rectify if necessary and repeat checks.

R TEST NO.11 - REHEAT LIGHT UP AND LEAK CHECK

A. Procedure

WARNING: APPROACH ENGINE FROM SIDE. TAKE CARE TO AVOID INTAKE AND SPILL DOOR SUCTION AREAS AND THE ENGINE HOT AND COLD VENTS. FUEL HEAT MUST BE IN THE OFF POSITION.

(1) The fuel tube joints which are going to be leak checked should be sprayed with Checkmor liquid developer.

(2) Engine Bay Doors - OPEN

(3) Reheat Switch - Select REHEAT

(4) White light on Aj indicator - Check ON

(5) CON light - Check OUT

(6) Throttle lever - Accelerate engine to 85% NI and stabilize

(7) Fuel Flow Indicator Flag - Check indicates FT

NOTE: Should reheat fail to light-up make a second selection.

(8) Throttle lever - Quickly retard to idle. Check that reheat cancels by observing a decrease in Aj and fuel flow (check of 10% throttle lever switch)

(9) Fuel Flow Indicator Flag - Check indicates Ft

(10) White light on Aj indicator - Check still ON

(11) With the engine at idle power, carefully examine the fuel tube joints which were sprayed with Checkmor liquid developer. Any evidence of staining of the developer is indicative of fuel leakage from the joint.

R **TEST NO.12 - HP OVERSPEED GOVERNOR CHECK**

A. Engine bay Doors Open

B. Engine Rating Mode S/W - T/O

C. Throttle Lever - IDLE

D. Assemble datum reset and adjuster tool P/No. 2-72-2151-IBA to the FCU HP overspeed governor and reduce datum setting - see figure 505.

(1) Insert tool through support bracket on second stage pump and engage sleeve pins with datum change sleeve slots.

(2) Turn sleeve in direction of arrow marked L on the support bracket. Check tool fully engaged to ensure datum depressed.

(3) Leave tool in position for duration of Test.

(4) Move throttle lever slowly and progressively until N_2 stabilises at 89.5 ± 1%. Further throttle movement should be ineffective.

(5) If N_2 stabilises outside tolerance band, RETARD ENGINE TO IDLE and adjust the governor datum as follows:

R (a) Push inner adjuster shaft upward against its spring pressure and engage the square end of datum governor adjuster.

R (b) Adjust as necessary - clockwise to increase change in N_2.

R 6 clicks = 1 turn
R 3 turns = 1%

R (c) Record adjustment.

R If adjustment in excess of 5 turns in either direction is required, do not proceed further with this check and investigate the cause.

R (d) Disengage inner adjuster shaft from governor adjuster and repeat check in paragraph (4).

R (6) When low datum figure is satisfactorily achieved, exercise the governor control system.

R (a) Advance throttle lever progressively to fully open position, to achieve governed speed.

R (b) Decelerate engine to below 80% N_2.

R (c) Repeat checks (a) and (b) to complete a total of 5 governor operations.

R (7) On satisfactory completion of the above check, remove datum reset tool by turning tool outer sleeve clockwise, in direction of arrow H, as indicated on the support bracket.

R (8) Remove tool from datum change sleeve slots and withdraw through support bracket.

R (9) Advance throttle lever progressively until N_2 obtained is positively above the depressed figure previously obtained in paragraph (4).

R (10) Slowly reduce speed to idle rpm, and maintain this speed for 3 minutes.

R TEST NO.13 - LP OVERSPEED GOVERNOR CHECK

WARNING: WHEN BUTTON IS DEPRESSED DUE TO THE SUDDEN CHANGE IN ENGINE POWER, THE AIRCRAFT MAY VEER QUITE CONSIDERABLY.

A. Procedure

(1) Accelerate engine and stabilise at 75% N2.

(2) Gain access to the LP overspeed amplifier located in the LH or RH Fwd electrical racking.

Engine No.	Shelf
1	2-215
2	1-215
3	1-216
4	2-216

(3) Press the N1 overspeed dip button on the front of the amplifier.
Expect a transient dip in the order of 1-2% N1.

(4) If no drop in N2 occurs at 75% N2, repeat the check at increments of 5% N2 to a maximum of 85% N2 until a dip is observed.

(5) Record dip experienced.

R **TEST NO.14 - PRIMARY NOZZLE CONTROL (PNC) CHECK**

A. Engine Bay Doors - OPEN

B. Throttle Lever - IDLE

(1) Record the ambient temperature T1.

(2) Record the N2/root theta and nozzle trim angle to be used for the prevailing temperature T1.

T1°C	N2/root theta	Nozzle Trim Angle
0 to 30	101.5%	79 ± 3°
Below 0 or above 30	97.5%	71 ± 3°

TABLE 3

NOTE: If the check is carried out at 97.5% N2 an ADD should be raised to repeat the check at 101.5% N2 at the next base visit when the temperature allows. In any event, the check should be repeated, within the constraints of the prevailing temperature T1, no more than 50 hours after initial trimming. Final trimming should be carried out at 101.5% N2.

(3) Determine and record the target N2 equivalent to the required N2/root theta by reference to (Ref. Fig.509).

(4) Select alternate control lane and fix nozzle angle test set PE 35380 to the Socket 2 (SKT 2) of the main control lane amplifier - see table for location. Refer to (Ref. Fig.506).
Reselect the main control lane.

(5) Ensure that E low is selected.

Accelerate engine and stabilise at 85% N2. Select and hold trim close on the test set. A reduction
R of engine N1 may occur. Allow test set meter
R reading to stabilise and adjust the test set "ADJUST
R ZERO" potentiometer to give a meter reading of 10°.
R Release trim close switch.

(6) Accelerate engine to 1 - 2% above the target N2 determined in (3) and hold at this speed for 1 minute.

(7) After 1 minute reduce N2 to the target N2 determined in (3) and check if trim angle registered on test set is within limits.

<u>NOTE:</u> The target N2 determined in (3) must be approached for the check by deceleration only. Use (Ref. Fig.510) if the target N2 which is achieved is different from the target N2 determined in (3) to compute the revised nozzle trim angle. See worked example for further explanation.

CAUTION: IF A PNC ADJUSTMENT OF OVER TWO TURNS OR A COMBINATION OF ADJUSTMENTS TOTALLING OVER TWO TURNS IS REQUIRED THE ENGINE MUST BE SHUT DOWN. INVESTIGATION INTO A POSSIBLE SYSTEM DEFECT OR AIR LEAKAGE MUST BE CARRIED OUT IN ACCORDANCE WITH 71-00-56 CHART 103.

(8) If the trim angle falls outside the limits, decelerate the engine to idle and carry out an adjustment as follows:-

R Engine adjusting key PE 15924 or S3S.20516000 with square end of the PNC adjustment screw. Adjust PNC to a maximum of two turns in either direction to bring the nozzle trim angle within the limits determined in (8).

Adjustment rate 1 turn = 15 to 20° - clockwise to increase angle - see (Ref. Fig.506).

(9) After carrying out adjustment, repeat (7) to determine if the nozzle trim angle is now within limits.

(10) With throttle lever at idle, select alternate lane and disconnect test set from main lane engine control amplifier. Refit socket cover and re-select main lane.

Locations

Engine Posn		1	2	3	4
Main ECU	Zone	215	215	216	216
	Shelf	8	6	8	6
Alternate ECU	Zone	215	215	216	216
	Shelf	6	8	6	8

(11) Worked Example - Primary Nozzle Control (PNC) Check.

(a) Record ambient temperature e.g. 20°C.

(b) Required N2/root theta from Table 3 - 101.5%.

Required nozzle trim angle from Table 3 - 79° ± 3°.

(c) Target N2 equivalent to 101.5% N2/root theta for 20°C from Fig.509 is 102.18% N2.

(d) If, when decelerating the engine from 1 - 2% N2 above 102.18% N2, the 102.18% N2 datum is over or undershot, it is possible to use (Ref. Fig.510) to calculate the revised trim angle.

If, for example, the achieved N2 is 101.5% instead of 102.18% N2 proceed as follows:

variation between target and achieved N2 is 102.18% - 101.5% = 0.68% N2.

An undershoot occurred, thus the 0.68% N2 will be negative.

(e) Using Fig.510 enter - 0.68% N2 on the horizontal axis and draw a line vertically upwards until the 101.5% N2/root theta line is intersected.

From the intersection draw a line horizontally across until the vertical axis of the graph is intersected.
This equates to + 3.2°.
Therefore revised trim angle is 79 + 3.2 = 82.2°.
Therefore revised nozzle trim angle is 82.2 ± 3°.

R TEST NO.15 - ENGINE ANTI ICE CHECK

A. Procedure

(1) Throttle lever - IDLE

(2) Engine Anti-ice S/W - Select ON

(3) I.G.V. press.caption - ILLUMINATED

NOTE: It may be necessary to accelerate engine above idle power to put the I.G.V. press.caption ON.

(4) Engine anti-Ice s/w - Select OFF

(5) I.G.V. press. caption - Check EXTINGUISHED

NOTE: If T1 below 3°C, re-select anti-ice on.

R TEST NO.16 - FUEL HEATING CHECK

WARNING: EXHAUST AIR FROM FUEL HEATER IS VERY HOT, PERSONNEL MUST BE WELL CLEAR OF THIS AREA DURING CHECKS.

A. Procedure

(1) Throttle Lever - IDLE

(2) Fuel Heat s/w - Select OFF (if not already off)

NOTE: Fuel heat will remain on for 3 mins. when switched off

(3) Fuel temp. indication (eng) - Observe stabilised reading

(4) Fuel heat s/w - Select ON, after gaining clearance from ground

(5) Fuel temp. indication (eng) - Compare reading

R B obtained with
R B above. Temp. rise
R B should be approx.
R B 30°C.

R B (6) Fuel heat s/w - Select AUTO

TEST NO.17 - OIL PRESSURE CHECK

R NOTE: Procedure A using the cockpit gauge can be used for
R observing indicated oil pressure. When trouble-shooting
R or if oil pressure adjustment is required Procedure B
R must be used.

R A. Procedure A

NOTE: This check can be carried out concurrent with other high power checks.

(1) Accelerate engine to 90% N2 and stabilise the engine.

(2) Observe and record indicated oil pressure. Acceptable limit 22.5 ± 0.5 psig.

(3) Reduce engine speed to idle; minimum acceptable limit 18 psig.

NOTE: This is a check figure and should not be used as a setting limit.

CAUTION: DO NOT ADJUST OIL PRESSURE WITH ENGINE RUNNING. REFER TO MM 72-01-00 ADJUSTMENT/ TEST.

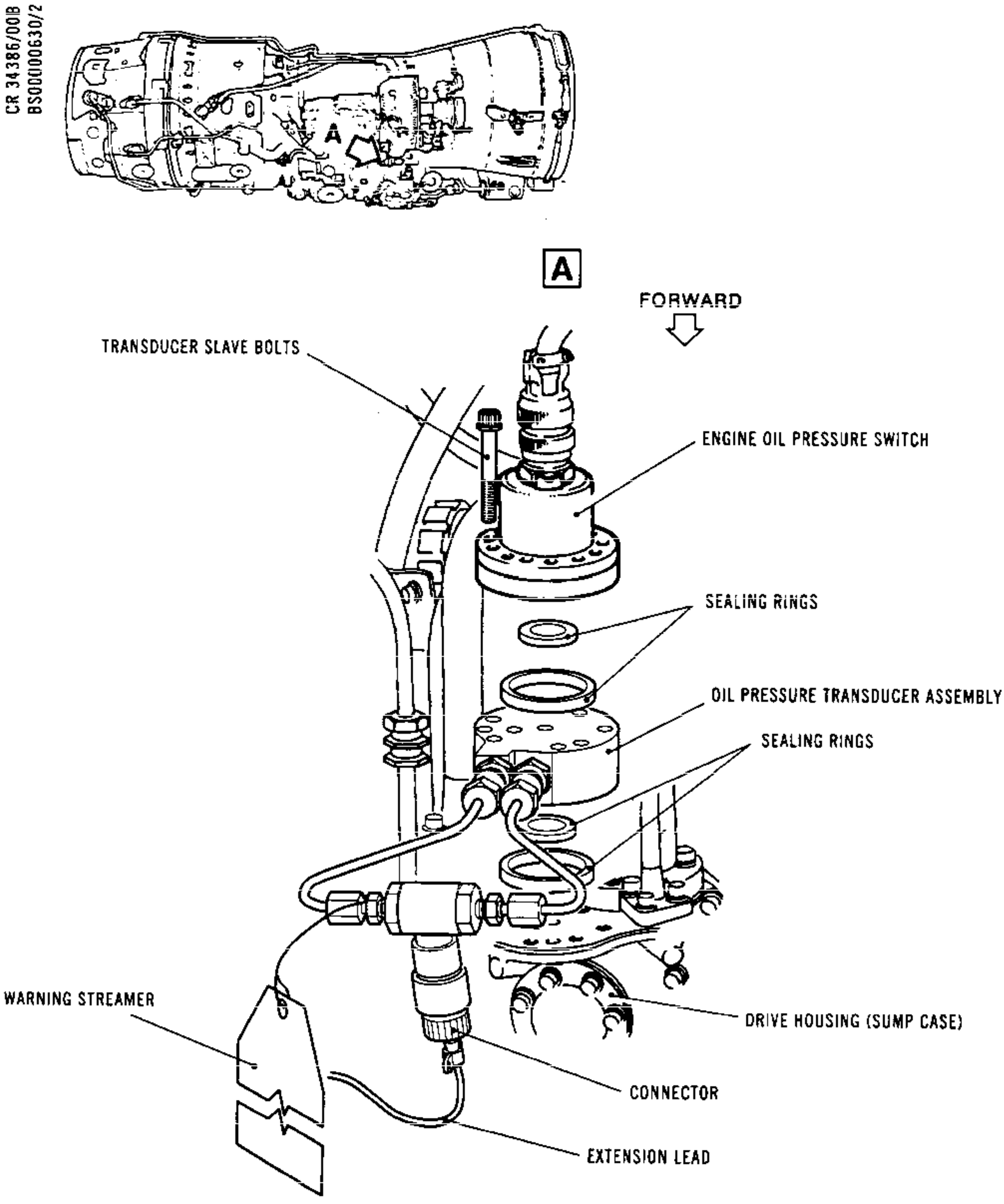
R FOR ENGINES TO SB OL593-71-8562-146
R STANDARD CM 45188 THE RESTRICTOR IN THE 2 AND 3 BEARING FEED PIPE LOCATED IN THE ELBOW ON THE INTERMEDIATE CASE AT THE 3 O'CLOCK POSITION MUST BE REMOVED AND THE OIL PRESSURE SET TO 26 PSIG .

THE RESTRICTOR MUST THEN BE REFITTED AND OIL PRESSURE SHOULD FALL IN THE LIMIT 13.5 ± 3.5 PSIG. IF IT DOES NOT, REFER TO PROPULSION ENGINEERING.

R REFER TO CHAPTER 72-01-00 ADJUSTMENT/TEST FOR FURTHER DETAILS.

R B. Procedure B (Ref. Fig.506A)

R NOTE: This check can be carried out concurrent with other
R high power checks provided the pressure test block
R is installed between the drive housing (sump case)
R and oil pressure switch with the gauge connected,
R before starting engine.



Test Equipment Installation
Figure 506A (Sheet 1 of 2)

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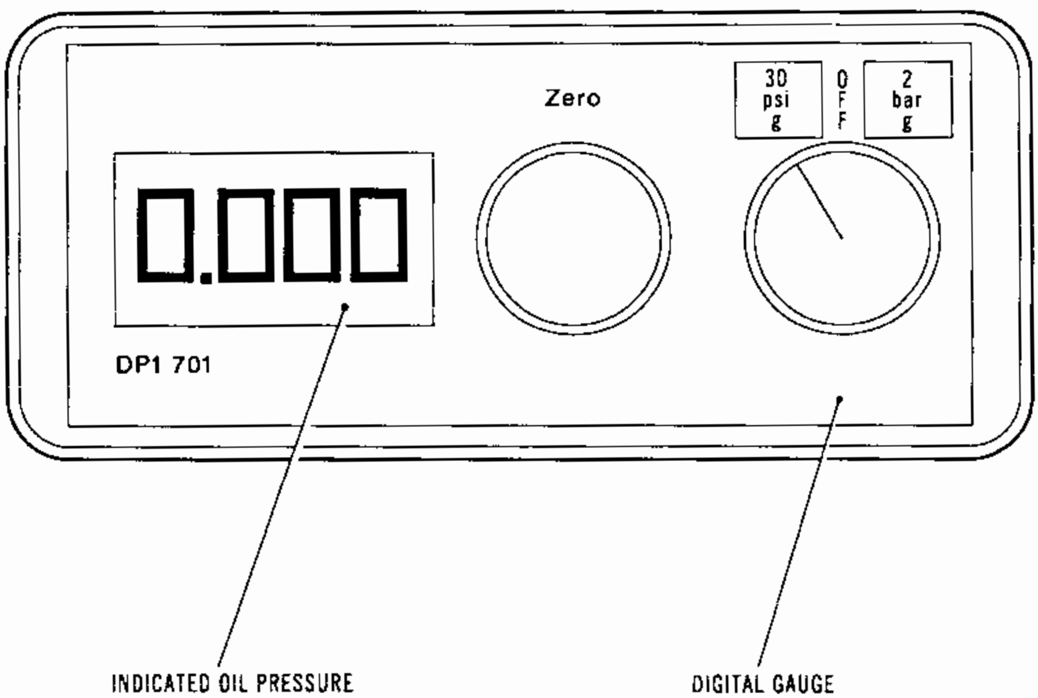

Test Equipment Installation
Figure 506A (Sheet 2 of 2)

(1) Remove bolts securing switch to drive housing (sump case). Support switch and secure clear of work area.

CAUTION: ENSURE ALL MATING FACES ARE CLEAN AND FREE FROM ANY CONTAMINATION.

(2) Install oil pressure transducer assembly
R S3S.20211000 and pressure switch together on drive housing (sump case).

(a) Ensure serviceable sealing rings are in position in switch grooves.

(b) Support pressure switch and transducer assembly, align holes with holes in drive housing (sump case) position two serviceable sealing rings between transducer and housing.

(c) Secure switch and assembly with transducer slave bolts. Torque-tighten to between 85 and 95 lbf in. (9,6 and 10,7 Nm).

(3) Connect transducer assembly to digital gauge.

(a) Connect extension lead connector to transducer and secure cable straining device to a suitable point on the engine.

(b) Run the extension lead to the digital gauge ensuring lead is well secured at suitable points well away from the engine intakes.

(c) Connect lead to digital gauge.

NOTE: The gauge can be positioned at any suitable vantage point as the extension lead is 66 yards (60 metres) long. When selecting point and during use, care must be taken not to damage lead.

(4) Switch on digital gauge by selecting PSI range, then zero the reading.

NOTE: If zero is difficult to achieve or reading is erratic, check condition of battery which is housed in the rear of the digital gauge (see low battery warning indicator).

(5) With throttle lever at idle position, verify that engine is at steady rpm and then accelerate to above 90% N_2.

(6) Observe and record indicated oil pressure on the digital gauge. Acceptable pressure;

On engines to pre SB OL593-72-8562-146 and pre SB OL593-8525-188 standard: 22 + 1 - 0 psig.

On engines to SB OL593-72-8562-146 (restricted oil feed) standard: 13.5 ± 3.5 psig.

On engines to SB OL593-72-8525-188 standard: 26 + 1 - 0 psig.

<u>CAUTION:</u> DO NOT ADJUST OIL PRESSURE WITH ENGINE RUNNING.

(7) If adjustment is required, stop engine and adjust relief valve as detailed in Chapter 72-01-00, Adjustment/Test and then repeat the check.

(8) After satisfactory check and with engine stopped, remove pressure test equipment, ensure digital gauge switched off, and stow.

(9) Install switch.

(a) Apply lubricant A (Ref. Chapter 70-00-01, Servicing and Storage of Materials) to switch securing bolts.

(b) Assemble two new sealing rings, or those certified as serviceable, to grooves in switch face.

(c) Position switch on drive housing (sump case) mounting face with assembly pins engaged. Check sealing rings have not been displaced, then press switch into position on housing.

(d) Secure switch with seven bolts torque-tightened to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

(e) Ensure that electrical lead end plug is secure and wire-locked.

TEST NO.18 - ACCELERATION/DECLERATION CHECK

B THROTTLE MOVEMENT

B CAUTION: IN THE FOLLOWING CHECK, THE RAPID RETURN TO IDLE IS ESPECIALLY IMPORTANT WHEN AIR INTAKE TEMPERATURE T1 IS BELOW 0 DEG C. THIS WILL MINIMIZE RUNNING IN THE N1 RESTRICTED SPEED BAND.

B A. Procedure

B (1) Either lane may be used for the check, as required.
B If alternative control lane is to be used for check,
B verify that adjacent engine is at idle rpm.

(2) Ensure that the ENGINE RATING MODE switch is at TAKE-OFF.

(3) With throttle lever at idle, verify that engine is at steady idle rpm.

(4) Accelerate engine to 85% N1 and observe primary nozzle action as indicated in AREA indicator. The nozzle should close and then start to open before 82% N1.

(5) Return throttle lever to idle position and wait for engine to stabilize at steady idle rpm.

ACCELERATION/DECELERATION

CAUTION: CARRY OUT THIS CHECK WHEN TEMPERATURE T1 IS ABOVE 0°C.

B. Procedure

(1) Ascertain the T/O N2 for the day from (Ref. Fig. 507) and subtract 2% from this figure. Record the acceleration check N2 on the data sheet.

(2) Select Main Control lane and ensure that the engine rating mode switch is at T/O.

(3) Stabilize the engine at idle.

(4) Slam the throttle to the fully forward position and at the same time as throttle lever movement is initiated, start the a/c clock.

(5) Record the time taken for the engine to achieve T/O N2 less than 2%. The acceleration time should be less than the value given in Table 3A.

(6) Allow engine to STABLIZE AT T/O conditions and make sure that the T/O ratings (Ref. Fig.507) are not exceeded. Record Max N2 achieved.

(7) Retard throttle lever to idle and ensure that engine responds to throttle lever movement. The deceleration time should be less than the value given in Table 3A.

Acceleration time	9 seconds (Max)
Deceleration time	TBA

Table 3A

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B (8) Repeat (2) through (7) using the alternate lane.
B For these tests, the adjacent engine must be run at
B idle.

B (9) Select back to main lane.

TEST NO.19 - STABILIZED IDLE CHECK

A. Procedure

(1) Throttle lever - IDLE for 30 secs

(2) Hydraulic pumps - Pressurized but NO hydaulic loads applied.

(3) AC Generator - On line with minimum generator load required for engine running.

(4) Air Conditioning - Con valve OPEN

(5) Ground Idle S/W - Hi

(6) Record the indicated N2% and fuel flow FE on both main and alternate lanes.

(7) Throttle Master S/W - Select back to MAIN

Check the minimum N2 against (Ref. Fig.507) for the ambient temp T1 of the day.

Fuel flow FE should not exceed 1350 kg/hr.

TEST NO.20 - PERFORMANCE CHECK

A. Procedure

NOTE: This check can be carried out on either main or alternate lanes.

(1) Record ambient temp T1 and barometric pressure QFE.

(2) From Table 4, determine the required performance checking rating point for the ambient temp. recorded in (1).

Ambient Temp T1°C	Performance Check Rating Point
-20 to -1	97.5% N2/root theta
0 to 30	101.5% N2/root theta
Above 30	100% N2/root theta

TABLE 4

(3) For the required rating point, determine and record the target N2 for the ambient temp. conditions from (Ref.Fig.508).

(4) Accelerate the engine to the target N2 determined in (3) and stabilise the engine at this figure for 1 minute. After 1 minute record the following parameters:-

N2, N1, FE, EGT, AJ, P7, oil pressure and oil temp. TCA.

(5) Decelerate the engine to idle and check that the values of FE, P7 and EGT fall within the maximum and minimum values quoted in Appendix B for the rating point used and ambient day conditions recorded in (1).

(6) Taking into account the tolerance given below - Check that the N1 obtained meets the nominal N1 value given in (Ref.Fig.508) for the Rating Point and Ambient Day conditions recorded in (1).

AMBIENT TEMP TIC	RATING POINT	TOLERANCE ON NOMINAL N1
-20 TO -1	97.5 N2/root theta	± 1%
0 to 30	101.5 N2/root theta	± 0.5%
ABOVE 30	100 N2/root theta	± 1%

Contact Power Unit Engineering if any of the recorded values fall outside the acceptable limits.

TEST NO.21 - REHEAT FUEL CONNECTOR LEAK CHECK

Reheat Fuel Connector Leak Check

NOTE: If a leak check under static pressure has been carried out and found satisfactory (Ref.73-12-06, Adjustment/Test), there is no need for an engine run.

A. Carry out the reheat check detailed in TEST No.11 and check for fuel leaks at fuel tube connections from controller to spray ring with the engine doors open.

RB TEST NO.22 - DELETED

TEST NO.23 - HOT ENGINE LEAK CHECK

A. Engine Bay Doors - OPEN

B. Throttle Lever - IDLE

(1) Inspect the engine for excessive oil spills from drains and vents. Pay particular attention to the oil tank vent valve overboard vent, oil drains tubes and air vents.

(2) Inspect the installation for excessive fuel spills, paying particular attention to all fuel tube connections, fuel drains tubes and especially the fuel overboard vent just fwd of the drains tank. No fuel should be seen coming from the fuel overboard drain whilst the engine is running

NOTE: Pay particular attention to the fuel system if no static leak check has been carried out on the engine prior to installation or ground running.

WARNING: APPROACH ENGINE FROM SIDE. TAKE CARE TO AVOID INTAKE AND SPILL DOOR SUCTION AREAS AND THE ENGINE HOT AND COLD VENTS. FUEL HEAT MUST BE IN THE OFF POSITION.

TEST NO.24 - ENGINE RUN DOWN CHECK

SPECIAL NOTE:

This is carried out in conjunction with a normal shut down.

A. Procedure

(1) Inform ground contact that a run down time is required.

(2) Carry out shut down procedure as detailed in Test No.19. On operation of HP Valve S/W to Shut, inform ground crew to commence run down timing. Start a/c clock to enable N2 run-down to be obtained.

Check for any abnormal felt vibration.

Record time for N2 to stop indicating and obtain LP compressor run down time from ground.

Minimum run down times

LP compressor	-	150 secs.
HP compressor	-	50 secs.

R **TEST NO.25 - NORMAL SHUT-DOWN - BEFORE SHUT-DOWN SEE SPECIAL NOTE**

SPECIAL NOTE: For engine installation or IDG change run, carry out Test 26 before carrying out Test 25.

A. Procedure

(1)	Throttle lever	IDLE - Run engine at idle rpm for 2 minutes before shutting down
(2)	Ground Power available Caption	ILLUMINATED This is only necessary if engine being shut down is the only engine running
(3)	SSB s/w	CLOSE - Arms the ground power breaker
(4)	Generators	ON - i.e. GCBs closed
(4a)	Ground Power s/w	Select ground power if this is last engine being shut down
(5)	HP Valve s/w	SHUT - check MIs show shut, engines run down

NOTE: If engine does not run down select LP valve shut.

(6)	Throttle Master selectors	OFF
(7)	Auto Ignition s/w's	OFF
(8)	Engine Anti-Icing s/w	OFF
(9)	Reheat selectors	OFF
(10)	Cancelled	
(11)	Lights anti-coln. s/w	OFF
(12)	Ignition selector	OFF
(13)	Cond. valves s/w	OFF
(14)	Cond. valves MIs	CROSS LINE

(15) Main transfer pumps - OFF

(16) Engine feed pumps - OFF

(17) Battery selectors - Batt. OFF

(18) ADCs - OFF

(19) Intake Ramp/Spill Masters- MANUAL/GUARDED

(20) White CBs - PULL

(21) Fwd Pax Door - DISARM

Inform VHF contact that engine running is complete

(22) VHF - OFF

(23) ADS Probe Heaters - OFF
Standby s/w - OFF

(24) Nav's Lights - OFF

R <u>TEST NO.26 - SHUT DOWN AFTER ENGINE INSTALLATION OR IDG CHANGE</u>

A. Procedure

(1) Hydraulic Pump Selectors - OFF/AUTO

(2) Ground Power available - ILLUMINATED This is only necessary if engine being shut down is the only engine running

(3) SSN s/w - CLOSE

(4) Ground Power s/w - Select ground power if this is last eng being shut down

(5) Generator Control s/w - OFF

(6) Throttle lever - IDLE - run engine at Idle for 2 mins before shutting down

(7) CSD disconnect s/w - "DISC" and release. Check IDG bus disconnected by observing illumination of CSD caption

NOTE: Do not hold s/w to "DISC" for more than 5 secs.

(8) HP valve s/w - 'SHUT' check MIs show 'SHUT' engine runs down

NOTE: If engine does not run down select LP valve 'SHUT'. When engine has ceased rotation, gain access to IDG and reconnect IDG.

(9) Restart the engine as in Test No.4 normal engine start - Check CSD caption extinguishes

(10) Shut down engine IAW Test No.25 - Normal Shut down

R TEST NO.27 - AFTER RUN CHECKS

A. Procedure

(1) Press "Press to test Valve" in fuel overboard vent and check that no fuel drains from well above valve.

NOTE: Fuel collecting in the well is indicative of excessive gland seal leakage. To troubleshoot origin of excessive leakage refer to M.M. 73-00-00 Adjustment/Test.

(2) On a newly installed engine, check the master magnetic plugs, oil pressure filter and No.4 bearing scavenge filter for contamination.

(a) If either of these filters show any contamination with carbon particles, check all the other scavenge filters for contamination.

(b) Clean and refit filters.

(c) Run engine at idle for 5 minutes.

(d) Recheck any filters that previously showed contamination.

(e) Repeat operations (a) to (d) until no further carbon deposits are found.

(f) Any filters found contaminated must be rechecked at aircrafts next visit to London.

(3) Check engine and IDG oil levels.

(4) If engine installation run has been carried out, check hydraulic tank(s) contents and replenish if necessary.

(5) Engine bay doors open/closed as required.

(6) Documentation complete.

R TEST NO.28 - AFTER EXTENDED PERIOD OF STORAGE

A. Test as specified in MM 71-00-00 Page Block 600 Inspection/ Check.

10. STARTING PROBLEMS

For engine ground run, the correct actions covering problems that could be encountered during a start are:-

A. Failure to light i.e. No EGT rise within 8 seconds of opening HP Valve.

(1)	HP Valve S/W	- Select SHUT
(2)	HP Valve M.I.	- Check SHUT
(3)	Engine Debow S/W	- Select NORMAL
(4)	After 2 minutes	- Carry out dry motoring cycle to clear excess fuel (20 secs duration) before attempting a further start using both igniters.

CAUTION: DO NOT ATTEMPT A FURTHER START WITH AN ENGINE NOSE DOWN ATTITUDE GREATER THAN 2.5 DEGREES. THIS ATTITUDE PREVENTS A SATISFACTORY EXPULSION OF RESIDUAL FUEL.

B. Failure to clear rotating stall.

NOTE: Depending upon altitude and ambient temperature it may not be possible to detect the difference in engine idle speed and rotating stall speed. If it is thought that the engine has definitely not cleared rotating stall, shut down the engine. Do not move throttle master s/w or throttle lever.

(1)	HP Valve	- Select SHUT

(2) HP Valve M.I. - Check SHUT

NOTE: At altitudes between 0 and 500 feet and T1 between 10-25°C, rotating stall should be apparent.

C. Excessive EGT on start

If the rate of jet pipe temperature increase is such that the maximum starting temperature of 450° may be exceeded

(1) HP Valve s/w - Select SHUT

(2) HP Valve M.I. - Check SHUT

(3) Complete the shut down procedure

D. Start Valve

If during or following a start with N2 above 25%

(1) Start Valve M.I. - OPEN or CROSS HATCHED

(2) Air start valve manual override - Request select CLOSED by the ground crew.

(3) If Start Valve M.I. Shut down the engine on the HP Valve - Still open or cross hatched

E. Throttle failure during starting cycle

Do not move the Throttle Master switch during a starting sequence. Should the Throt caption (Red) illuminate during the starting sequence, shut down.

(1) HP Valve S/W - Select SHUT

(2) Engine Debow S/W - Select NORMAL

(3) HP Valve M.I. - Check SHUT

(4) Engine Debow S/W toggle light - OUT

CAUTION: DO NOT SELECT ENGINE DEBOW S/W TO DEBOW WITHIN 1 MINUTE OF SELECTION TO NORMAL.

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F. Failure of N2 to stabilize in a debow mode.

The engine speed should stabilize at approximately 30% N2 for 1 minute after the RELIGHT/START switch has returned to OFF during the starting cycle. At this point the ENGINE DEBOW switch illuminates. If 32% N2 is exceeded, abandon the start.

(1) HP Valve switch - Select SHUT

(2) HP Valve MI - Check SHUT

(3) Complete the shut down procedure

G. Paragraph deleted.

H. Failure to accelerate during Starting Cycle

If the engine fails to accelerate to idle, or engine speed stagnates during the starting sequence, shut down the engine on the HP valve.

RB CAUTION: ANY STEADY STATE RUNNING IN THE RANGE DEBOW TO
RB IDLE IS NOT PERMITTED.

R 11. ABNORMAL PROCEDURES

R B See responsibility chart Table 2 for individual
R B responsibilities where necessary.

R B A. (1) Power Plant Fire Warning - Engine bay doors closed.

R B (a) Throttle Lever - IDLE

R B (b) Engine shut-down handle - PULL
R B (ESDH)
R B Inform ground crew and
R B contact on VHF

R B When fire flaps caption
R B illuminates or 7 secs
R B after pulling ESDH

R B (c) 1 shot button - Press
R B if
R B after 30 secs ESDH - Still flashing

R B (d) 2 shot button - Press

R B (2) Complete the shutdown procedure

R B (a) ESDH - Confirm out -
R B *If not out, 2nd
R B shot has not
R B extinguished fire

R B (b) Secondary Air Doors M.I. - Confirm SHUT

R B (c) HP Valve S/W - Select SHUT

R B (d) HP Valve M.I. - Check SHUT

R B (e) LP Valve S/W - Select SHUT 1 or
R B SHUT 2

R B (f) LP Valve M.I. - Check cross line

R B (g) Hydraulic SOV(s) M.I(s) - Check cross line

R B (h) Auto ignition S/W - Ensure selected OFF

R B (i) R/H S/W - Ensure selected OFF

R B (j) If running shut down other engines on HP valve.

R B NOTE: * If ESDH still flashing external assistance will be

necessary to contain and extinguish fire.

B. Power Plant Fire Warning - Engine bay doors open

(1) Throttle Lever - IDLE

(2) Engine shut-down handle - PULL
Inform ground crew and contact
on VHF

(3) Throttle Lever - Set IDLE

(4) Complete the shutdown procedure as detailed in A(2)

(5) If running shut down other engines on HP valve.
External assistance will be required to extinguish
fire.

Extinguishing gas should be directed into the engine
intake including the region above the rear ramp, the
engine bay and the jet pipe, BCF or CO2 may be used.

C. Engine Red Indication, i.e. steady red in ESDH - unexpected

(1) Throttle lever - Retard rapidly to IDLE

(2) ESDH - PULL
Inform ground crew
Complete the shut down
Procedure as detailed in A(2)
Determine the condition of the engine and if it is
safe to do so, reset the ESDH.

D. Throttle Failure Warning - Double lane failure, i.e. if
throttle caption remains illuminated after hard select
away from failed lane or 2 ECVs have failed during the
ground run on the same engine shut down the engine
immediately.

(1) Immediate shut down procedure

(a) Throttle lever - Retard quickly to IDLE

(b) HP Valve S/W - Select SHUT

(c) HP Valve M.I. - Check shut. If not, CLOSE LP Valve

(d) Auto ignition - Select OFF

(e) R/H S/W - Ensure OFF

(2) Throttle Failure Warning - Single lane failure

(a) "Throt" caption - ILLUMINATED

(b) Throttle master S/W - Select serviceable lane

Check "Throt" caption extinguishes
Observe precautions for running engine on alternative lane if necessary.

R E. Paragraph deleted.

F. (1) Engine oil temperature - amber - unexpected

(a) Engine oil temperature Amber W/L - ON
Shut down engine IAW D (1)

(2) If oil temp > 190°C

(a) Fuel Heat S/W - Confirm off (provided fuel temperature > 70°C)

(b) Engine Recirculation Valve - Select OPEN

(3) If oil temp still > 190°C after 5 mins or amber w/l comes on - shut down engine IAW D(1)

G. Fuel temperature amber warning - unexpected

(1) Fuel temperature w/l - ON

(2) Fuel Heater S/W - Select OFF

(3) Engine recirculation Valve - Select OPEN

If after 2 mins - Still > 150°C or if fuel temperature exceeds 170°C

Shut down engine IAW D(1)

H. Amber Fuel Filter Differential Pressure Warning - unexpected

(1) Fuel Filter Caption - ON

(2) Fuel Heater - Select ON provided fuel temperature < 70°C

(3) Engine Recirculation Valve - Check SHUT
If fuel temp > 70°C, problem is not due to icing, shut down engine IAW D(1)

I. Amber NAC/Wing Overheat Warning - Unexpected

(1) Nac/Wing o/heat Caption - ON
Shut down engine IAW D (1)

J. Amber Wind down Caption - ON

(1) Rev blue light flashing - Shut down engine IAW D(1)

(2) Rev blue light not flashing - Change engine control lane

(3) If Wind down caption - Still ON

(4) Throttle lever - Retard to IDLE

(5) Wind down Indication System CBs - Pull

Continue engine run or troubleshoot IAW Maintenance Manual as required.

CBs Location

Engine	1	2	3	4
CB Location	1K1101 1K1108	2K1101 2K1108	3K1101 3K1108	4K1101 4K1108

K. EGT Indicator Warning Light

(1) EGT Indicator W/L - ON

(2) Throttle Master S/W - Select other lane

(3) If EGT Indicator W/L - remains ON
Shut down engine IAW D(1)

L. Engine Overspeed or Runaway

If engine exceeds given N1 or N2 limitations or runs away, shut down engine IAW D(1).

M. Failure of engine to shut down

If following selection of the HP Valve s/w to shut for a normal shut down the engine continues to run, close the LP Valve.

N. Primary Nozzle Malfunction

If the primary nozzle area % indication fails to respond to normal throttle lever movements and a gauge failure is not suspected

(1) Throttle Lever - Set IDLE
(2) Shut down engine IAW D(1)
Refer to MM for troubleshooting

O. LP Compressor Shaft Failure

The engine will be shut down automatically if an LP shaft failure occurs.

After automatic engine shut down

(1) HP Valve M.I. - Check indicates SHUT while HP valve s/w is selected open

(2) Auto Ignition S/W - Select OFF

R B (3) Throttle lever - Set to IDLE

R B (4) HP Valve S/W - Select OFF

R B P. Overfull Condition of Engine Oil Tank

R B (1) Oil Contents Gauge W/L - ON

R B NOTE: If warning occurs before or during start ignore providing warning light goes out at idle.

R B (2) Check Gauge Contents - If oil contents greater than 14 quarts shut down engine IAW D(1). If oil contents is normal then warning is due to a malfunction of the overfull warning system and engine run may continue.

R B NOTE: For all other abnormal engine indications, refer to the Maintenance Manual for troubleshooting.

12. APPENDIX A

A. SYSTEM STATIC CHECKS i.e. Engines Not Running

(1) Wind Down Test - *There are two No. 2 Air SOV & Down Test S/W's - one S/W for engine 1 & 4 the other for engines 2 & 3

(a)	No. 2 Air SOV & Wind Down Test S/W (Test S/W)	- OFF
(b)	Throttle Master S/W	- MAIN or ALTERNATE
(c)	Advance throttle levers above idle	
(d)	Rev Caption	- OUT
(e)	Wind Down Caption	- OUT
(f)	Test S/W	- Position A
(g)	Rev Caption	- ON
(h)	Test S/W	- Position B
(i)	Rev & Wind Down Captions	- ON
(j)	Test S/W	- Position C
(k)	Rev Caption	- Flashing
(l)	Wind Down Caption	- OUT
(m)	Retard thrust lever to idle	
(n)	Test S/W	- Position B
(o)	Rev Caption	- ON
(p)	Pull up reverse throttle lever to engage normal detent, reverse baulk should be energised.	
(q)	Test S/W	- OFF
(r)	Rev Caption	- OUT
(s)	Wind Down Caption	- ON

(t) Push reverse throttle lever fully down

(u) Wind Down Caption - OUT

R (2) Paragraph deleted.

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RB (3) Engine Fire and Nacelle Overheat Test

RB (a) Rotate Fire and Nacelle Overheat Test rotary
RB selector to OVERHEAT, observe

RB Nac/Wing O/heat lts	ON
RB MWS engine ambers	ON
RB MWS gong	SOUNDS

RB (b) Rotate Fire and Nacelle Overheat Test rotary
RB selector to FAULT, observe

RB Fire bell	SOUNDS
RB	(press audio cancel switch)
RB Fire sensor loop A lts	ON
RB Fire sensor loop B lts	ON
RB MWS engine ambers	ON
RB MWS engine reds	ON
RB MWS gong	SOUNDS
RB Engine shut down handle lts	ON=FLASHING

RB (c) Select Fire Sensor sws (four off) to position A,
RB observe

RB B loop lts	OFF
RB	(A remain ON)

RB (d) Select Fire Sensor sws (four off) to position B,
RB observe

RB A loop lts	OFF
RB	(B remain ON)

RB (e) Select Fire Sensor sws (four off) to position
RB BOTH

RB (f) Press MWS cancel switch, observe

RB MWS panel	FAULT WARNINGS CLEAR

RB Rotate and hold Fire and Nacelle Overheat Test
RB rotary selector, in a position midway between
RB FAULT and FIRE 1, until engine shut down handle
RB lt stops flashing.

RB NOTE: The position between FAULT and FIRE 1 is
RB held to allow time for relays in the MWS
RB to reset.

RB (g) Rotate Fire and Nacelle Overheat Test rotary selector to FIRE 1, observe

RB Fire sensors loops A and B lts	OFF
RB No. 1 engine shut down handle lt	ON-FLASHING
RB MWS No. 1 engine red	ON
RB Fire bell	SOUNDS
RB MWS gong	SOUNDS

RB (h) Repeat step (g) for FIRE 2, 3 and 4

RB (i) Rotate Fire and Nacelle Overheat Test rotary
RB selector to OFF, observe

RB No. 4 engine shut down handle lt	OFF

RB (j) Press MWS cancel sw, observe

RB MWS engine reds	OFF

RB (4) <u>Fire Bottle Cartridge Test</u>

B (a) Fire Ext. Pressure Cartridge - FIRST SHOT
B Test Selector

B Observe magnetic indicators show DIS.

B (b) Fire Ext. Pressure Cartridge - SECOND SHOT
B Test Selector

B Observe magnetic indicators show DIS.

B (c) Fire Ext. Pressure Cartridge - NORM
B Test Selector

B Observe magnetic indicators show Full.

RB (5) <u>Warning Systems Test</u>

B (a) Fuel Filter Caption - Press

B (b) Throt Caption - Press

B Observe in each case that caption and associated
B master warning caption illuminates and gong
B sounds.

(6) <u>Smoke Cabin & Freight Hold & Air Generation Test</u>

(a)	Smoke Cabin & Freight Hold Selector	- All, check smoke A, B, C, D, E, F, G, H, J, & K, MWS Smoke Captions illuminate & Audio Gong
(b)	Smoke Cabin & Freight Hold Selector	- Norm, check Smoke and MWS Smoke Captions OFF
(c)	Air Generation Selector	- Norm, check Smoke 1, 2, 3, 4 and Fault 1, 2, 3, 4 Captions OFF

(7) <u>Equipment Bay Cooling</u>

(a)	Fwd Extract Main Selector	- AUTO
(b)	Fwd Supply Selector	- NORM
(c)	Fwd Emergy. Relief switch	- SHUT
(d)	Rear Extract LH and RH switches	- ON
(e)	Fwd Extract Standby switch	- OFF
(f)	Rear Extract Standby switch	- OFF

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B. AIR INTAKE CONTROL SYSTEM PRE-FLIGHT CHECK - ENGINES STATIC. PRELIMINARY TEST IN CONJUNCTION WITH TWO AIRCRAFT GROUND HYDRAULIC CHECK-OUT PUMPS.

(1) Prepare

(a) Make available electrical ground power as detailed in 24-41-00.

(b) Ensure that for the duration of the test -

b1) the equipment racking air extraction system (Ref. 21-21-00) is operating and

b2) the four intakes and the areas below the spill doors remain clear of persons and equipment.

(c) Post notices, warning of AICS Operational Test in progress, and position barriers to prevent persons from inadvertently entering the area in the vicinity of the ramps and spill doors.

(d) Check that the master warning system (MWS) (Ref. 33-15-00) and the associated audio warning system (AWS) (Ref. 31-23-00) are operating.

(e) Ensure that the MWS red and amber INT captions are extinguished; cancel them if necessary.

(f) Test the filaments (Ref. 33-14-00) on the ACP, the air intake test panel (AITP) and the auto N1 reduce lamp on the N1 indicators (Ref. Chap.71).

(2) Test

(a) Set the RAMP - SPILL MASTER switches to "MAN". Check that the INT captions on the auto control panel (ACP) and the MWS red INT captions are illuminated, accompanied by the single-stroke gong; press-to-cancel the MWS red INT captions.

<u>NOTE</u>: If the master warning system (red) is not cancelled the single-stroke gong tone is repeated at approximately 8 s intervals.

(b) At the flying controls servo controls hydraulic selection panel (Ref. 27-34-00) set the upper switch to "NORMAL".

(c) At the flying controls relay jacks panel (Ref. 27-34-00) set the selector switch to "NORM".

(d) At the ground hydraulics check-out panel (Ref. 29-23-00) set -

d1) the hydraulic selector to "YELLOW-YELLOW",

d2) the hydraulic pump switch PUMP 1 G-Y to "ON", and

d3) after a short delay the hydraulic pump switch PUMP 2 B-Y to "ON" (both pumps must not be switched on simultaneously).

(e) At the ACP set -

e1) the four lane select switches to "A",

e2) the four hydraulic select switches to "YELLOW" and

e3) confirm that the ramp and spill door indicators display 0 per cent.

(f) Using the RAMP RAISE - LOWER inching switches, lower each ramp, in turn, approximately 20 per cent and then return it to the fully-up position (0 per cent).

(g) Using the SPILL CLOSE - OPEN inching switches, open each spill door, in turn, approximately 20 per cent, wait for 3 s and check that during this time the spill door does not move and then return it to the fully closed position (0 per cent).

(h) At the ground hydraulic check-out panel set the hydraulic selector to "GREEN-BLUE".

(i) At the ACP set the four hydraulic select switches to "AUTO".

(j) Repeat operations (f) and (g).

(k) Set the four RAMP - SPILL MASTER switches to "AUTO". Check that -

k1) the alpha, INT, LANE and HYD failure captions, the lane B lane-in-use lamps

and the N1 reduce lamps on the N1 indicators are extinguished, and

k2) the lane A lane-in-use lamps and the N1 SIG fail captions are illuminated, accompanied by the amber INT master warnings.

(l) Set the four RAMP - SPILL MASTER switches to "MAN".

(m) Press-to-cancel the MWS red INT captions.

(n) Press-to-test the N1 SIG, LANE and HYD failure captions on the ACP, in turn. Check that each caption is illuminated and the MWS amber INT caption is illuminated, accompanied by the sounding of a single-stroke gong.

(o) Press-to-test the alpha fail caption on the ACP. Check that the caption is illuminated and the four MWS amber INT captions are illuminated, accompanied by the sounding of a single-stroke gong.

(p) Set the four lane select switches to "AUTO A'.

(q) After Service Bulletin No. 71-001 for A/C 3-999:-

q1) At the ram air turbine (RAT) test panel (Ref. 29-24-00) set the AICS GROUND-FLIGHT switches to "GROUND".

q2) Check that the MWS red INT caption for each intake is illuminated, accompanied by a single-stroke gong.

q3) At the AITP set the intake test ON - OFF switch to "ON".

q4) Check that the HOLD caption is illuminated after a delay of approximately 7 s.

NOTE: A random light pattern will occur on the ACP and AITP until the test program is commenced by use of the CONTINUE - OFF switch.

q5) Continue test at operation (t).

(r) At the ground hydraulics check-out panel, set

R B the hydraulics selector to "GREEN-YELLOW". Allow at least one minute to elapse, to allow the blue hydraulic system to depressurize, before proceeding with the test.

R B (s) At the AITP set the intake test ON - OFF switch to "ON". Check that -

R B s1) the ON caption is illuminated,

R B s2) the MWS red INT caption for each intake is illuminated, accompanied by a single-stroke gong, and

R B s3) the HOLD caption is illuminated after a delay of approximately 7 s.

R B NOTE: A random light pattern will occur on the ACP and AITP until the test program is commenced by use of the the CONTINUE - OFF switch.

R B (t) Press-to-cancel the MWS red INT captions.

R B (u) Set the RAMP - SPILL MASTER switches for intakes 1 and 2 to "AUTO".

R B (v) Set the CONTINUE - OFF switch on the AITP to "CONTINUE". Check that the CHK HYD caption is illuminated.

R B (w) At the ground hydraulics check-out panel, select "YELLOW-YELLOW".

R B (x) At the flying controls servo controls hydraulic selection panel (Ref. 27-34-00) -

R B x1) Set the upper switch to "BLUE-ONLY".

R B x2) check that the GREEN L. PRESS caption is illuminated.

R B x3) press-to-cancel the MWS PFC, FEEL AND HYD captions, and

R B x4) check that the two 'blue solenoid selector' lamps are lit.

R B (y) At the flying controls relay jacks panel set the selector switch to "BLUE ONLY".

(z) Start the test program by setting the CONTINUE - OFF switch on the AITP to "CONTINUE":-

z1) Verify the correct operation of the failure captions on the ACP by observing that each caption is illuminated at least once during the test program.

NOTE: Operation of the associated master warnings by the failure captions has been previously checked in operations (n) and (o).

z2) Check that the HOLD caption is extinguished and remains extinguished, and that after approximately 5 min the B/Y REQD caption is illuminated.

NOTE: Illumination of the B/Y REQD caption, provided that the HOLD caption has not been re-illuminated during the test program, indicates the successful completion of the Preliminary Test on intakes 1 and 2.

Illumination of the HOLD caption during the test, accompanied by the appropriate equipment failure caption and a binary address display, indicates that a failure has been detected and that the test sequence has stopped. Refer to Table 502 as applied to intakes 1 and 2 for the binary pattern number and the expected result for each pattern. The pattern number is determined by adding together the illuminated numbers on the AITP binary address. The test sequence can be continued by resetting the CONTINUE - OFF switch to CONTINUE.

The RESET switch on the AITP allows the test program to be reset to the beginning at any time during the test sequence.

(aa) At the ground hydraulics check-out panel change the hydraulic supplies from GREEN-YELLOW to YELLOW-YELLOW.

(ab) At the flying control servo controls hydraulic selection panel -

ab1) set the upper switch to "GREEN ONLY",

ab2) check that the BLUE L.PRESS caption is illuminated,

ab3) press-to-cancel the MWS PFC, FEEL and HYD captions, and

ab4) check that the two 'green solenoid' selector, lamps are lit.

(ac) At the flying controls relay jacks panel set the selector switch to "GREEN ONLY".

(ad) At the ground hydraulics check-out panel set the hydraulic selector to "BLUE-YELLOW".

(ae) Set Nos. 3 & 4 intakes RAMP - SPILL MASTER switches to "AUTO" and Nos. 1 and 2 intakes RAMP - SPILL MASTER switches to "MAN". Check that Nos. 1 and 2 INT failure captions are illuminated, accompanied by the MWS red captions; press-to-cancel the MWS red INT captions.

(af) Start the test program by setting the CONTINUE - OFF switch on the AITP to CONTINUE:-

af1) Verify the correct operation of the failure captions on the ACP by observing that each caption is illuminated at least once during the test program.

<u>NOTE:</u> Operation of the associated master warnings by the failure captions has been previously checked in operations (n) and (o).

af2) Check that the HOLD caption is extinguished and remains extinguished, and that after approximately 5 min the N1 REQD caption is illuminated.

<u>NOTE:</u> Illumination of the N1 REQD caption, provided that the HOLD caption has not been re-illuminated during the test program, indicates the successful completion of the Preliminary Test on all four intakes.

Illumination of the HOLD caption during the test, accompanied by the appropriate

equipment failure caption and a binary address display, indiates that a failure has been detected and that the test sequence has stopped. Refer to Table 502 as applied to intakes 3 and 4 for the binary pattern and the expected result for each pattern. The pattern number is determined by adding together the illuminated numbers on the AITP binary address. The test sequence can be continued by resetting the CONTINUE - OFF switch to CONTINUE.

The RESET switch on the AITP allows the test program to be reset to the beginning at any time during the test sequence.

(ag) Check that the pointers on all four pressure ratio error indicators are at the twelve o'clock position.

(3) Conclusion

(a) Set the intake test ON - OFF switch to "OFF" and position the switch guard to maintain the switch at OFF. Check that the ON caption is extinguished.

(b) After Service Bulletin No.71-001 for A/C 3-999:-

b1) Set the RAMP - SPILL MASTER switches for intakes 1 and 2 to "AUTO".

b2) Set the AICS GROUND - FLIGHT switches to "FLIGHT" and position the switch guards to maintain the switches at the FLIGHT position.

b3) Press the MWS RECALL push-switch and check that the MWS red INT captions remain extinguished.

b4) Set Nos. 1 and 2 intakes RAMP - SPILL MASTER switches to "MAN".

(c) Set Nos. 3 and 4 intakes RAMP - SPILL MASTER switches to "MAN". Press-to-cancel Nos. 3 and 4 red MWS INT failure captions.

(d) Set the RESET - OFF switch on the AITP to

"RESET" and release it. Check that all captions on the AITP are extinguished.

(e) At the ground hydraulics check-out panel set the hydraulic pump switches PUMP 1 G-Y and PUMP 2 B-Y to "OFF".

(f) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(g) Remove all barriers and warning placards.

CAPTION	ALP-HA	N1 SIG	INT	LANE-IN-USE	LANE	HYD	N1 REDUCE
INTAKE	ALL	1234	1234	11223344	11223344	1234	1234
LANE				ABABABAB	ABABABAB		
PATTERN							
01	-	----	----	*-*-*-*-	--------	----	----
02	-	----	----	*-*-*--	--------	----	**--
03	-	----	----	*-*-*--	--------	----	--**
04	-	****	----	-*-*-*-	*-*-*-*-	----	----
05	-	****	----	-*-*-*-*	*-*-*-*-	----	**--
06	-	****	----	-*-*-*-*	*-*-*--	----	--**
07	-	----	----	*--**--*	--*---*-	-*-*	----
08	-	----	**--	------*-*	*****-*-	****	----
09	-	----	****	--------	********	****	----
10	-	----	----	*-*-*-*-	--------	-*-*	----
11	-	****	----	-*-*-*-	*-*-*-*-	-*-*	----
12	-	****	****	--------	********	----	----
13	-	----	****	--------	********	----	----
14	*	----	****	--------	********	----	----
15	"NONSENSE PATTERN" to ensure that the AITU can produce a FAIL at beginning of sequence.						
16	-	----	----	-*-**-*-	*-*-----	**--	----
17	-	----	----	-**--**-	*---*---	*-*-	----
18	-	----	----	*-*-*-*-	--------	*-*-	----
19	-	****	----	-*-*-*-*	*-*-*-*-	*-*-	----
20	-	****	****	--------	********	*-*-	----
21	-	****	****	--------	********	-*-*	----
22	*	----	****	--------	********	----	----
23	*	----	****	--------	********	----	----
24	-	----	****	--------	********	----	----
25	-	----	-*--	-*---**-	*-***---	----	----
26	-	----	----	--------	--------	----	----
27	-	----	****	--------	********	----	----
28	*	----	****	--------	********	----	----
29	-	----	----	-**-*-*-	*------*	----	----
30	-	----	**--	------*-*	*****-*-	----	----
31	-	----	----	--------	--------	----	----
32	-	----	****	--------	********	----	----

CAPTION	ALP-HA	N1	SIG INT	LANE-IN-USE	LANE	HYD	N1 REDUCE
INTAKE	ALL	1234	1234	11223344	11223344	1234	1234
LANE				ABABABAB	ABABABAB		
PATTERN							
33	-	----	----	-*-**-*-	*-*-*---	----	----
34	*	----	****	--------	********	----	----
35	-	----	****	--------	********	----	----
36	-	----	----	--------	--------	----	----
37	-	----	****	--------	********	----	----
38	-	----	----	*-*-*-*-	--------	----	----
39	-	----	----	--------	--------	----	----
40	-	****	----	-*-*-*-*	*-*-*-*-	*-*-	----
41	-	****	----	-*-*-*-*	*-*-*-*-	----	----
42	-	****	----	-*-*-*-*	*-*-*-*-	-*-*	----
43	-	****	****	--------	********	----	----
44	-	****	****	--------	********	----	----
45	-	----	****	--------	********	----	----
46	-	****	****	--------	********	----	----
47	-	****	****	--------	********	----	----
48	-	****	-*-*	-*---*--	*-***-**	*-*-	----
49	-	****	*-*-	---*---*	***-***-	-*-*	----

AITP Binary Pattern Number With Expected ACP and N1 Reduce
Display (Illuminated Captions Shown Thus *)
Table 502

C. SYSTEM DYNAMIC TEST - i.e. Engine Running

(1) Engine o/heat Test

Engine running at idle

(a) Rotate Eng o/Heat Test S/W clockwise to position - TCA

Observe

(i) "TCA TEMP" Indicators Pointers 4 Off - 640°C

(ii) "TCA" Indicator Warning Lights 4 Off - ON

(iii) Engine Shut Down Handle lights 4 Off - ON

(iv) Eng Captions Red, Master Warning Display 4 Off - ON

(v) Audio Gong - Sounds

(b) Rotate switch clockwise to the unmarked position between "TCA" and "A".

Observe all warnings cancel and indicator pointer returns to normal before continuing test.

(c) Rotate switch clockwise to position - A

(i) Engine O/Heat Caption Lights 4 off - ON

(ii) Engine Shut Down Handle Lights 4 Off - ON

(iii) Eng Captions Red, Master Warning Display 4 Off - ON

(iv) Audio Gong - Sounds

(d) Rotate switch clockwise to the unmarked position between 'A' and 'B'.

Observe warnings cancel. Wait 5 secs. at each of these positions.

(e) Continue clockwise rotation of the switch to remainder of test positions, observe warnings as detailed for Position A. See item (c) above.

NOTE: No.4 bearing overheat system now deleted.

(f) Finally return S/W clockwise to OFF, warnings cancelled.

D. Graphs and Tables

(Ref. Fig. 507) Take-Off Ratings and Minimum Idle.
(Ref. Fig. 508) Engine Installation Performance Check.
(Ref. Fig. 509) PNC Setting Check
(Ref. Fig. 510) PNC Adjustment
(Ref. Fig. 511) Temp. Corrected Idle N2-65%N2 root theta
(Ref. Fig. 512) Temperature Corrected Rotating Stall Clearance N2-67%N2 root theta

E. Acceptable Limits

Parameter	Rating Point N2/root theta	Ambient Temp T1°C	APPENDIX 'B' Table
Fuel Flow (FE)	97.5	-20 to 0°C	1
Jet Pipe Press (P7)	97.5	-20 to 0°C	2
EGT	97.5	-20 to 0°C	3
Fuel Flow (FE)	101.5	0 to 30°C	4
Jet Pipe Press (P7)	101.5	0 to 30°C	5
EGT	101.5	0 to 30°C	6
Fuel Flow (FE)	100	Above 30°C	7
Jet Pipe Press (P7)	100	Above 30°C	8
EGT	100	Above 30°C	9

N2/root theta
N2/root theta

Ambient Temp T1°C	TAKE OFF N2	TAKE OFF N1	TAKE OFF EGT	MIN IDLE N2
-40	95.7	87.9	803	60.0
-39	96.0	88.1	802	60.0
-38	96.2	88.3	802	60.0
-37	96.4	88.4	802	60.0
-36	96.6	88.6	802	60.0
-35	96.8	88.8	801	60.0
-34	97.0	89.0	801	60.0
-33	97.2	89.2	801	60.0
-32	97.4	89.4	801	60.0
-31	97.6	89.5	800	60.0
-30	97.8	89.7	800	60.0
-29	98.0	89.9	800	60.0
-28	98.2	90.1	799	60.0
-27	98.4	90.3	799	60.0
-26	98.6	90.5	799	60.0
-25	98.8	90.7	799	60.0
-24	99.0	90.8	798	60.0
-23	99.2	91.0	798	60.0
-22	99.4	91.2	798	60.0
-21	99.6	91.4	798	60.0
-20	99.8	91.6	797	60.0
-19	100.0	91.8	797	60.0
-18	100.2	91.9	797	60.0
-17	100.4	92.1	797	60.0
-16	100.6	92.3	796	60.0
-15	100.8	92.5	796	60.0
-14	100.9	92.7	796	60.0
-13	101.1	92.8	795	60.0
-12	101.3	93.0	795	60.0
-11	101.5	93.2	795	60.1
-10	101.7	93.4	795	60.2
- 9	101.9	93.5	794	60.3
- 8	102.1	93.7	794	60.4
- 7	102.3	93.9	794	60.5
- 6	102.5	94.1	794	60.7
- 5	102.7	94.2	793	60.8
- 4	102.9	94.4	793	60.9
- 3	103.1	94.6	793	61.0
- 2	103.3	94.8	793	61.1
- 1	103.5	94.9	792	61.2
0	103.6	95.1	792	61.3
1	103.8	95.3	792	61.4
2	104.0	95.5	791	61.6
3	104.2	95.6	791	61.7
4	104.4	95.8	791	61.8
5	104.6	96.0	791	61.9
6	104.7	96.2	790	62.0
7	104.7	96.3	790	62.1
8	104.7	96.5	790	62.2
9	104.7	96.7	790	62.3
10	104.7	96.8	789	62.5
11	104.8	97.0	789	62.6
12	104.8	97.2	789	62.7
13	104.8	97.4	789	62.8
14	104.8	97.5	788	62.9
15	104.8	97.7	788	63.0
16	104.9	97.9	788	63.1
17	104.9	98.0	788	63.2
18	104.9	98.2	787	63.3
19	104.9	98.4	787	63.4
20	104.9	98.5	787	63.5
21	105.0	98.7	786	63.7
22	105.0	98.9	786	63.8
23	105.0	99.0	786	63.9
24	105.0	99.2	786	64.0
25	105.0	99.4	785	64.1
26	105.1	99.5	785	64.2
27	105.1	99.7	785	64.3
28	105.1	99.9	785	64.4
29	105.1	100.0	784	64.5
30	105.1	100.2	784	64.5
31	105.2	100.4	784	64.7
32	105.2	100.5	784	64.8
33	105.2	100.7	783	64.9
34	105.2	100.9	783	65.0
35	105.2	101.0	783	65.2
36	105.3	101.2	784	65.3
37	105.3	101.4	784	65.4
38	105.3	101.5	784	65.5
39	105.3	101.7	785	65.6

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Take-Off Ratings and Minimum Idle
(Sheet 1 of 2)
Figure 507

B

R

Ambient Temp T1°C	TAKE-OFF			MIN IDLE
	N2	N1	EGT	N2
40	105.3	101.9	785	65.7
41	105.4	102.0	785	65.8
42	105.4	102.0	786	65.9
43	105.4	102.0	786	66.0
44	105.4	102.0	786	66.1
45	105.4	102.0	786	66.2
46	105.5	102.0	787	66.3
47	105.5	102.0	787	66.4
48	105.5	102.0	787	66.5
49	105.5	102.0	788	66.6
50	105.5	102.0	788	66.7
51	105.6	102.0	790	66.8
52	105.6	102.0	791	66.9
53	105.6	102.0	793	67.0
54	105.6	102.0	794	67.1
55	105.6	102.0	796	67.2
56	105.6	102.0	797	67.3
57	105.7	102.0	799	67.4
58	105.7	102.0	800	67.5
59	105.7	102.0	802	67.6
60	105.7	102.0	803	67.7

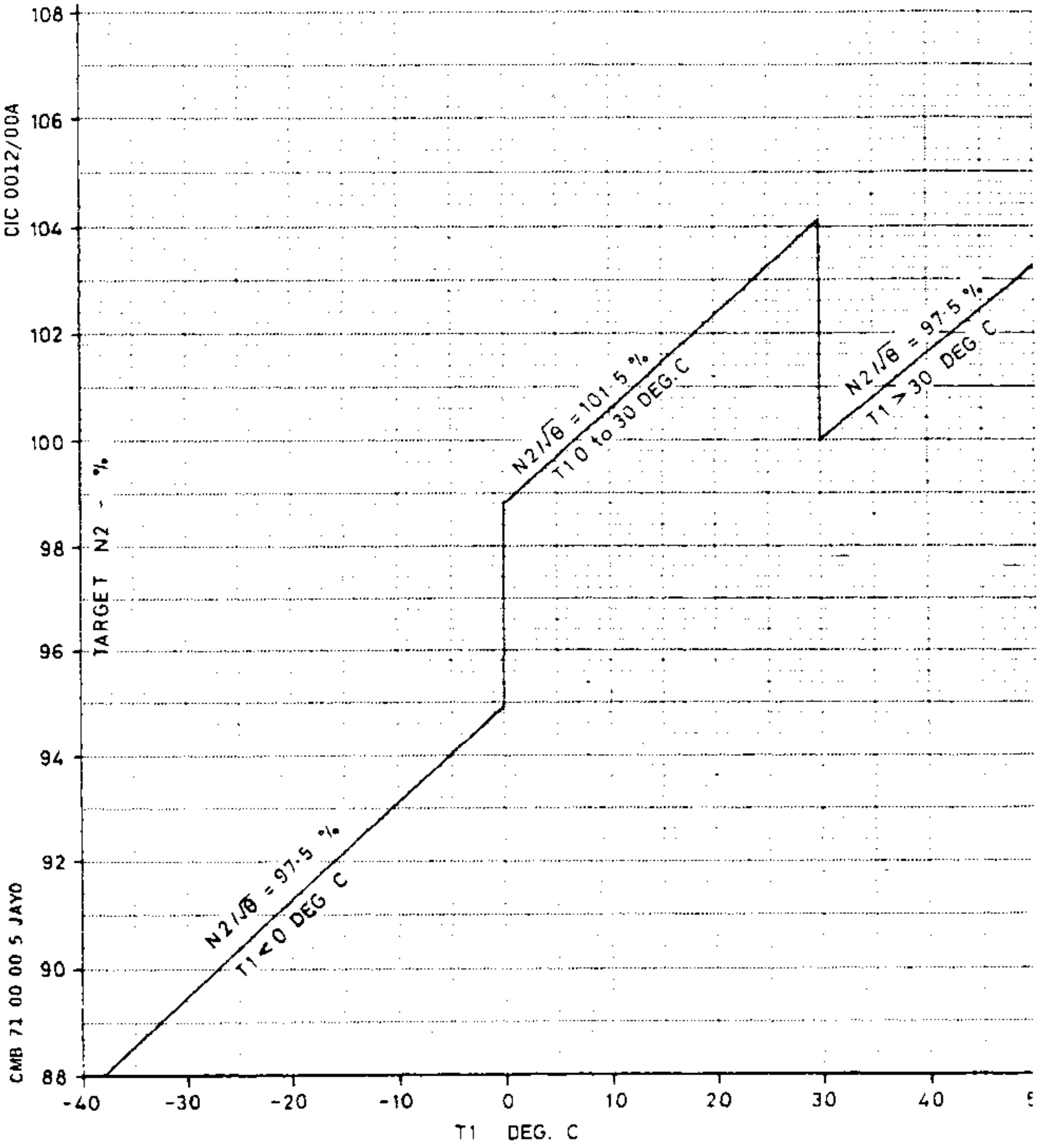
Take-Off Ratings and Minimum Idle
(Sheet 2 of 2)
Figure 507

Ambient Temp T1°C	Target N2	N1 Nominal	Ambient Temp T1°C	Target N2	N1 Nominal	Ambient Temp T1°C	Target N2	N1 Nominal
-20	91.4	83.4	0	98.8	93.6	31	102.7	98.8
-19	91.6	83.6	1	99.0	93.8	32	102.9	98.9
-18	91.7	83.8	2	99.2	94.0	33	103.1	99.1
-17	91.9	83.9	3	99.4	94.1	34	103.2	99.3
-16	92.1	84.1	4	99.5	94.3	35	103.4	99.4
-15	92.[illegible]	84.3	5	99.7	94.5	36	103.6	99.6
-14	92.5	84.4	6	99.9	94.6	37	103.7	99.8
-13	92.6	84.6	7	100.1	94.8	38	103.9	99.9
-12	92.8	84.8	8	100.3	95.0	39	104.1	100.1
-11	93.0	84.9	9	100.4	95.1	40	104.2	100.2
-10	93.[illegible]	85.1	10	100.6	95.3			
- 9	93.4	85.2	11	100.8	95.5			
- 8	93.5	85.4	12	101.0	95.6			
- 7	93.7	85.6	13	101.1	95.8			
- 6	93.9	85.7	14	101.3	96.0			
- 5	94.1	85.9	15	101.5	96.1			
- 4	94.2	86.0	16	101.7	96.3			
- 3	94.4	86.2	17	101.9	96.5			
- 2	94.6	86.4	18	102.0	96.6			
- 1	94.8	86.5	19	102.2	96.8			
			20	102.4	97.0			
			21	102.6	97.1			
			22	102.7	97.3			
			23	102.9	97.5			
			24	103.1	97.6			
			25	103.2	97.8			
			26	103.4	98.0			
			27	103.6	98.1			
			28	103.8	98.3			
			29	103.9	98.5			
			30	104.1	98.6			
97.5% N2/ Rating Point			101.5% N2/ Rating Point			100% N2/ Rating Point		

Engine Installation Performance Check Target N2 for Required Rating Point and Normal N1
Figure 508

B

R

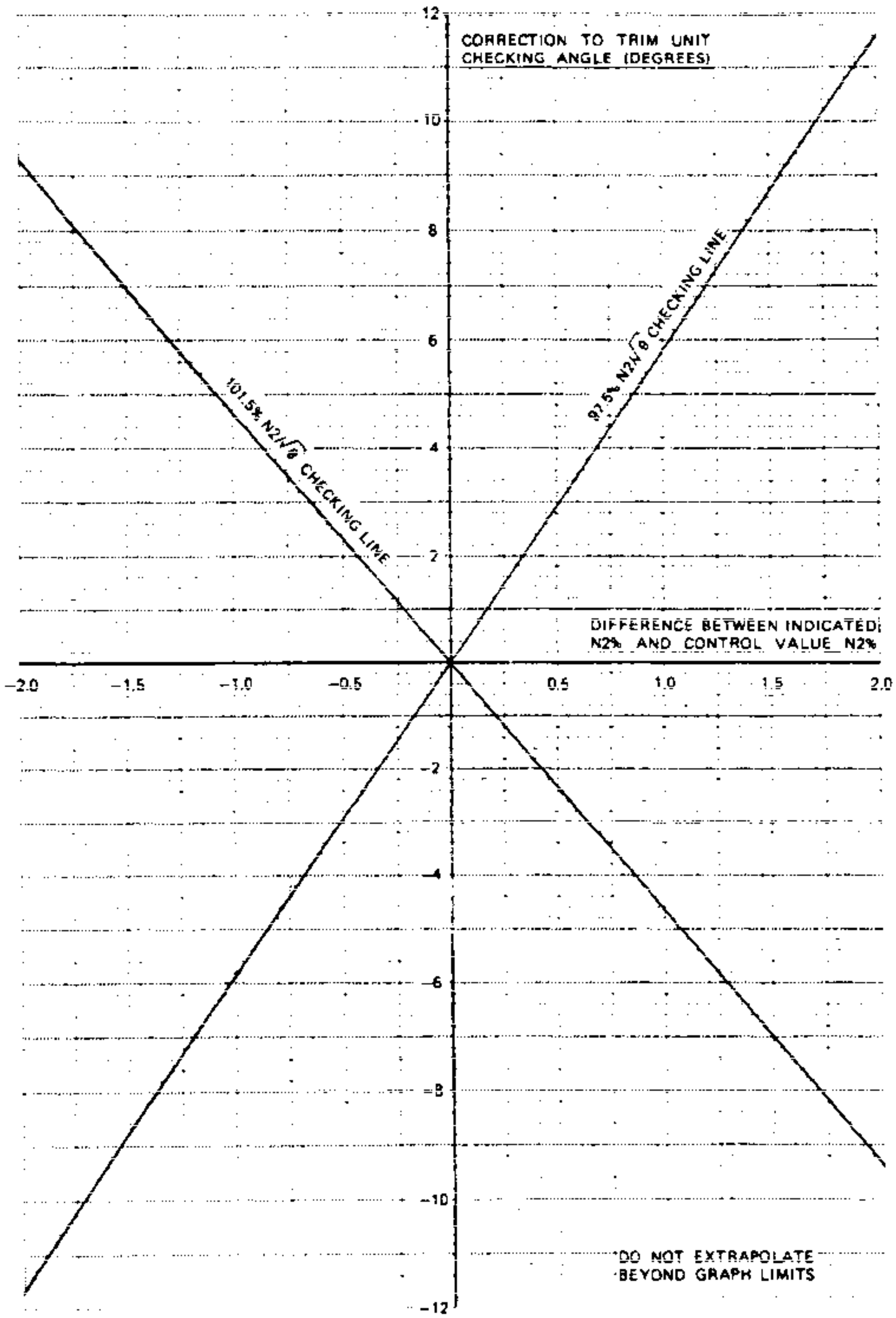


R

PNC Setting Check
Figure 509

B

CIC 0013/00A



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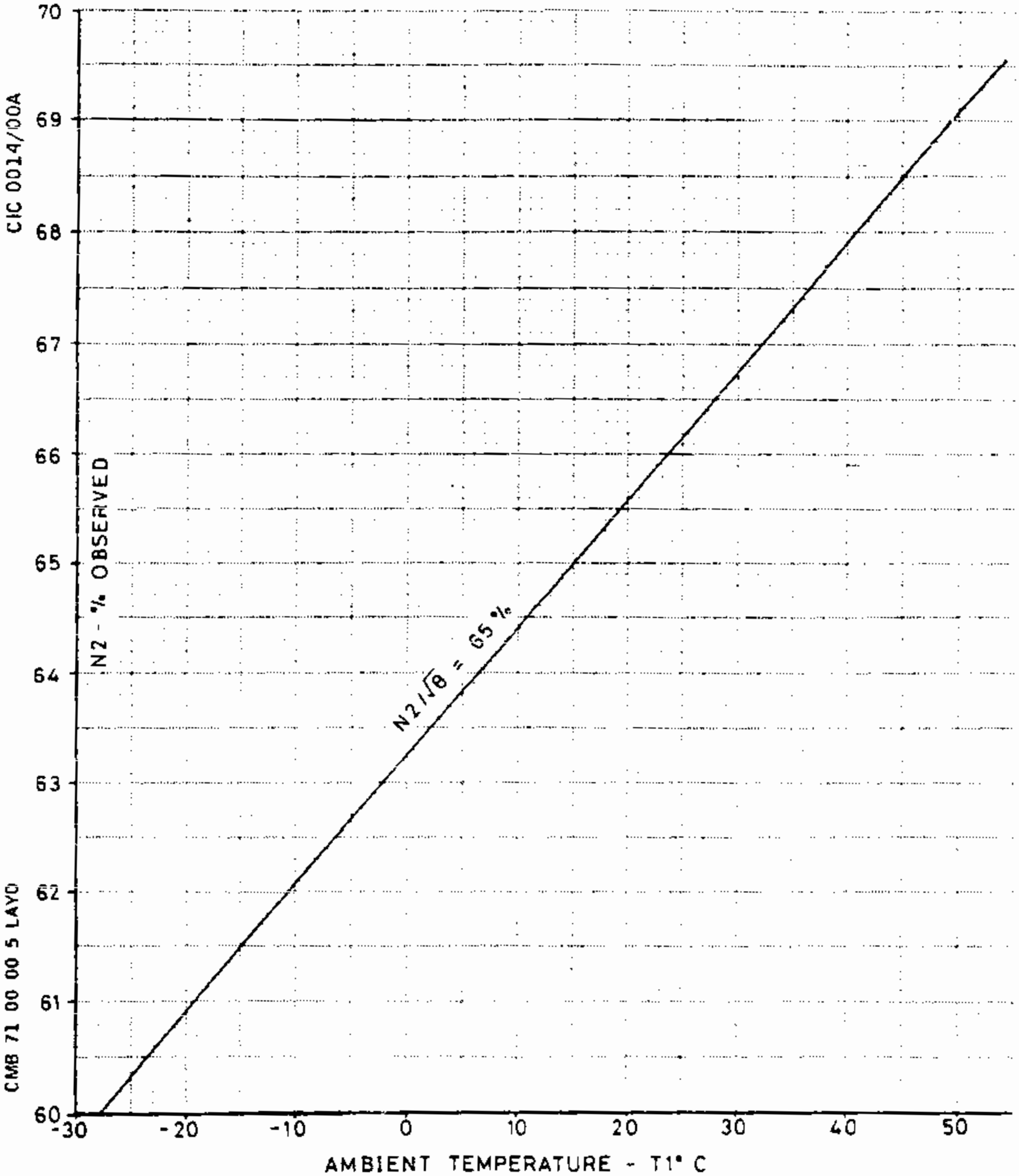
PNC Adjustment
Figure 510

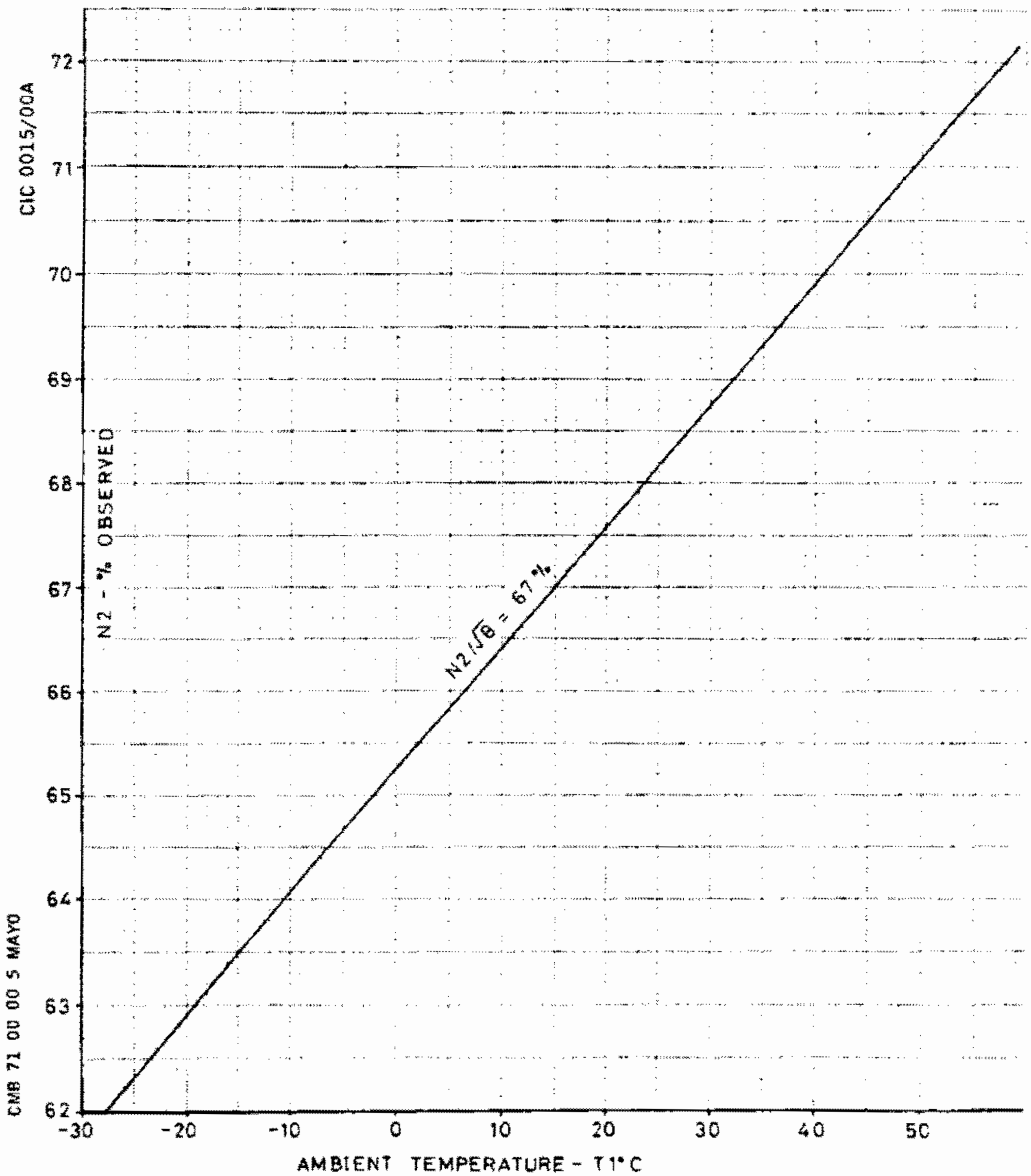
R B



R

Temperature Corrected Idle N2-65%
Figure 511

B



Temperature Corrected Idle N2-67%
Figure 512

R B

EFFECTIVITY: ALL

BA

MINIMUM FE (Kg/h)

	T1 QFE	-20.0	-18.0	-16.0	-14.0	-12.0
B	700	5183	5216	5249	5282	5315
B	720	5323	5357	5391	5425	5459
B	740	5462	5497	5532	5567	5601
B	760	5602	5637	5673	5708	5744
B	780	5730	5776	5812	5849	5885
B	800	5876	5914	5951	5988	6026
B	820	6010	6048	6086	6125	6163
B	840	6143	6181	6220	6259	6298
B	860	6273	6313	6353	6393	6432
B	880	6404	6445	6485	6526	6566
B	900	6547	6588	6629	6671	6712
B	920	6690	6733	6775	6817	6860
B	940	6834	6877	6920	6964	7007
B	960	6977	7021	7065	7110	7154
B	980	7124	7169	7213	7259	7304
B	1000	7269	7315	7361	7407	7453
B	1020	7416	7462	7509	7556	7603
B	1040	7502	7609	7657	7705	7753
B	1060	7708	7757	7805	7854	7902
B	1080	7854	7904	7953	8003	8052

B ACCEPTABLE LIMITS - ENGINE FUEL FLOW (FE)
B RATING POINT 97.5 N2/ROOT THETA -20°C TO 0°C AMBIENT TEMP TIC
B APPENDIX B - TABLE 1 (SHEET 1 of 4)

END OF THIS SECTION

NEXT

					MINIMUM FE (Kg/h)			
R	B	T1	-10.0	-8.0	-6.0	-4.0	-2.0	0.0
R	B	QFE						
R	B	700	5348	5381	5414	5448	5480	5514
R	B	720	5493	5526	5560	5594	5628	5662
R	B	740	5636	5671	5706	5740	5775	5810
R	B	760	5779	5815	5851	5886	5922	5958
R	B	780	5922	5958	5994	6031	6067	6104
R	B	800	6063	6100	6137	6175	6212	6250
R	B	820	6201	6239	6277	6315	6353	6392
R	B	840	6337	6376	6415	6454	6493	6532
R	B	860	6472	6511	6551	6591	6631	6671
R	B	880	6607	6647	6688	6729	6769	6810
R	B	900	6754	6795	6837	6878	6920	6961
R	B	920	6902	6944	6986	7029	7071	7114
R	B	940	7050	7093	7136	7180	7223	7266
R	B	960	7198	7242	7286	7330	7374	7419
R	B	980	7348	7393	7439	7484	7529	7574
R	B	1000	7499	7545	7591	7637	7683	7729
R	B	1020	7649	7696	7743	7790	7837	7884
R	B	1040	7800	7848	7896	7944	7991	8039
R	B	1060	7951	7999	8048	8097	8146	8195
R	B	1080	8102	8151	8201	8251	8300	8350

R B ACCEPTABLE LIMITS - ENGINE FULE FLOW (FE)
R B RATING POINT 97.5 N2/ROOT THETA -20°C to 0°C AMBIENT TEMP TIC
R B APPENDIX B - TABLE 1 (SHEET 2 of 4)

R B MAXIMUM FE (Kg/h)

R	B	T1 QFE	-20.0	-18.0	-16.0	-14.0	-12.0
R	B	700	5774	5810	5845	5881	5916
R	B	720	5925	5961	5997	6034	6070
R	B	740	6074	6112	6149	6186	6224
R	B	760	6224	6262	6300	6339	6377
R	B	780	6372	6411	6451	6490	6529
R	B	800	6520	6560	6600	6640	6680
R	B	820	6664	6705	6746	6787	6828
R	B	840	6807	6848	6890	6932	6974
R	B	860	6947	6990	7033	7076	7119
R	B	880	7089	7132	7176	7220	7263
R	B	900	7242	7287	7331	7376	7421
R	B	920	7397	7443	7488	7534	7580
R	B	940	7552	7599	7645	7692	7739
R	B	960	7707	7755	7802	7850	7898
R	B	980	7865	7914	7962	8011	8060
R	B	1000	8023	8073	8122	8172	8221
R	B	1020	8181	8232	8282	8333	8383
R	B	1040	8339	8391	8442	8494	8545
R	B	1060	8497	8550	8602	8655	8708
R	B	1080	8655	8709	8762	8816	8870

R B ACCEPTABLE LIMITS - ENGINE FUEL FLOW (FE)
R B RATING POINT 97.5 N2/ROOT THETA -20°C to 0°C AMBIENT TEMP TIC
R B APPENDIX B - TABLE 1 (SHEET 3 of 4)

MAXIMUM FE (Kg/h)

		T1 QFE	-10.0	-8.0	-6.0	-4.0	-2.0	0.0
R	B	700	5951	5987	6022	6058	6093	6129
R	B	720	6106	6143	6179	6216	6252	6289
R	B	740	6261	6298	6336	6373	6410	6448
R	B	760	6415	6453	6492	6530	6568	6607
R	B	780	6568	6607	6647	6686	6725	6765
R	B	800	6720	6760	6801	6841	6881	6922
R	B	820	6869	6910	6951	6993	7033	7075
R	B	840	7016	7058	7100	7142	7184	7226
R	B	860	7161	7204	7247	7290	7333	7376
R	B	880	7307	7351	7395	7439	7482	7526
R	B	900	7466	7510	7555	7600	7645	7690
R	B	920	7625	7671	7717	7763	7808	7854
R	B	940	7785	7832	7879	7926	7972	8019
R	B	960	7945	7993	8041	8088	8136	8184
R	B	980	8108	8157	8206	8254	8303	8352
R	B	1000	8271	8320	8370	8420	8470	8519
R	B	1020	8434	8484	8535	8586	8637	8687
R	B	1040	8597	8648	8700	8752	8804	8855
R	B	1060	8760	8812	8865	8918	8971	9024
R	B	1080	8923	8977	9030	9084	9138	9192

R B ACCEPTABLE LIMITS - ENGINE FUEL FLOW (FE)
R B RATING POINT 97.5 N2/ROOT THETA -20°C to 0°C AMBIENT TEMP TIC
R B APPENDIX B - TABLE 1 (SHEET 4 of 4)

			MINIMUM P7 (psig)				
R	B	T1	=20.0	=18.0	=16.0	=14.0	=12.0
R	B	QFE					
R	B	700	23.015	23.042	23.068	23.095	23.121
R	B	720	23.648	23.675	23.701	23.729	23.756
R	B	740	24.278	24.306	24.333	24.361	24.388
R	B	760	24.907	24.935	24.963	24.991	25.019
R	B	780	25.533	25.562	25.590	25.619	25.648
R	B	800	26.154	26.183	26.212	26.242	26.271
R	B	820	26.760	26.789	26.819	26.849	26.878
R	B	840	27.357	27.387	27.417	27.448	27.478
R	B	860	27.947	27.977	28.008	28.039	28.070
R	B	880	28.538	28.569	28.600	28.632	28.663
R	B	900	29.169	29.200	29.232	29.264	29.296
R	B	920	29.802	29.835	29.867	29.900	29.932
R	B	940	30.438	30.470	30.503	30.537	30.569
R	B	960	31.074	31.108	31.141	31.175	31.209
R	B	980	31.724	31.757	31.791	31.826	31.860
R	B	1000	32.374	32.409	32.443	32.479	32.513
R	B	1020	33.000	33.039	33.077	33.117	33.155
R	B	1040	33.651	33.690	33.729	33.769	33.808
R	B	1060	34.302	34.342	34.382	34.422	34.462
R	B	1080	34.953	34.994	35.034	35.075	35.115

R B ACCEPTABLE LIMITS - JET PIPE PRESSURE (P7)

R B RATING POINT 97.5 N2/ROOT THETA - 20 to 0°C AMBIENT TEMP.T1°C

R B APPENDIX B - TABLE 2 (SHEET 1 of 4)

R B MINIMUM P7 (psig)

R	B	T1 QFE	-10.0	-8.0	-6.0	-4.0	-2.0	0.0
R	B	700	23.148	23.174	23.200	23.226	23.252	23.278
R	B	720	23.783	23.810	23.836	23.863	23.889	23.916
R	B	740	24.416	24.443	24.471	24.498	24.525	24.552
R	B	760	25.048	25.075	25.103	25.131	25.158	25.186
R	B	780	25.677	25.705	25.733	25.761	25.789	25.817
R	B	800	26.300	26.329	26.358	26.386	26.415	26.444
R	B	820	26.909	26.938	26.967	26.996	27.026	27.055
R	B	840	27.508	27.538	27.568	27.598	27.628	27.657
R	B	860	28.101	28.131	28.161	28.192	28.222	28.252
R	B	880	28.695	28.726	28.757	28.787	28.818	28.849
R	B	900	29.328	29.360	29.391	29.423	29.454	29.485
R	B	920	29.965	29.997	30.029	30.061	30.093	30.125
R	B	940	30.603	30.635	30.668	30.701	30.733	30.765
R	B	960	31.243	31.276	31.309	31.342	31.375	31.408
R	B	980	31.895	31.928	31.962	31.996	33.030	32.063
R	B	1000	32.549	32.583	32.617	32.651	32.686	32.720
R	B	1020	33.194	33.232	33.270	33.307	33.344	33.381
R	B	1040	33.847	33.886	33.924	33.962	34.000	34.038
R	B	1060	34.502	34.540	34.579	34.618	34.656	34.694
R	B	1080	35.156	35.195	35.235	35.274	35.313	35.351

R B ACCEPTABLE LIMITS - JET PIPE PRESSURE (P7)
R B RATING POINT 97.5 N2/ROOT THETA - 20 to 0°C AMBIENT TEMP.T1°C
R B APPENDIX B - TABLE 2 (SHEET 2 of 4)

R B MAXIMUM P7 (psig)

R	B	T1 QFE	-20.0	-18.0	-16.0	-14.0	-12.0
R	B	700	25.678	25.699	25.720	25.742	25.763
R	B	720	26.372	26.394	26.416	26.438	26.460
R	B	740	27.064	27.087	27.109	27.132	27.155
R	B	760	27.754	27.777	27.801	27.825	27.848
R	B	780	28.442	28.466	28.490	28.515	28.539
R	B	800	29.124	29.149	29.173	29.199	29.224
R	B	820	29.790	29.815	29.840	29.866	29.892
R	B	840	30.446	30.472	30.498	30.525	30.551
R	B	860	31.094	31.121	31.147	31.175	31.202
R	B	880	31.745	31.772	31.799	31.828	31.855
R	B	900	32.438	32.466	32.494	32.523	32.552
R	B	920	33.135	33.164	33.193	33.223	33.252
R	B	940	33.834	33.864	33.893	33.924	33.954
R	B	960	34.535	34.565	34.595	34.627	34.657
R	B	980	35.250	35.280	35.311	35.343	35.375
R	B	1000	35.966	35.998	36.029	36.062	36.094
R	B	1020	36.706	36.735	36.764	36.794	36.824
R	B	1040	37.422	37.452	37.481	37.512	37.543
R	B	1060	38.139	38.169	38.199	38.231	38.263
R	B	1080	38.855	38.886	38.918	38.950	38.982

R B ACCEPTABLE LIMITS - JET PIPE PRESSURE (P7)
R B RATING POINT 97.5 N2/ROOT THETA - 20 to 0°C AMBIENT TEMP.T1°C
R B APPENDIX B - TABLE 2 (SHEET 3 of 4)

R B MAXIMUM P7 (psig)

R	B	T1 QFE	-10.0	-8.0	-6.0	-4.0	-2.0	0.0
R	B	700	25.785	25.806	25.828	25.849	25.870	25.892
R	B	720	26.483	26.505	26.527	26.549	26.571	26.593
R	B	740	27.178	27.201	27.224	27.247	27.270	27.293
R	B	760	27.872	27.896	27.919	27.943	27.967	27.990
R	B	780	28.564	28.588	28.612	28.636	28.661	28.685
R	B	800	29.249	29.274	29.299	29.324	29.350	29.375
R	B	820	29.918	29.944	29.970	29.995	30.021	30.047
R	B	840	30.578	30.604	30.631	30.657	30.684	30.710
R	B	860	31.230	31.257	31.284	31.311	31.338	31.365
R	B	880	31.884	31.911	31.939	31.967	31.995	32.023
R	B	900	32.581	32.609	32.638	32.666	32.695	32.724
R	B	920	33.282	33.311	33.340	33.369	33.399	33.428
R	B	940	33.984	34.014	34.044	34.074	34.104	34.134
R	B	960	34.689	34.719	34.750	34.781	34.811	34.842
R	B	980	35.407	35.438	35.470	35.501	35.533	35.564
R	B	1000	36.127	36.159	36.191	36.223	36.256	36.288
R	B	1020	36.854	36.884	36.914	36.945	36.975	37.006
R	B	1040	37.574	37.605	37.636	37.667	37.698	37.730
R	B	1060	38.295	38.326	38.358	38.390	38.422	38.454
R	B	1080	39.015	39.047	39.080	39.113	39.146	39.179

R B ACCEPTABLE LIMITS - JET PIPE PRESSURE (P7)
R B RATING POINT 97.5 N2/ROOT THETA - 20 to 0°C AMBIENT TEMP.T1°C
R B APPENDIX B - TABLE 2 (SHEET 4 of 4)

R B MINIMUM MEASURED EGT (deg C)

R	B	T1 QFE	-20.0	-18.0	-16.0	-14.0	-12.0	-10.0
R	B	700	475.9	482.4	488.7	495.2	501.8	508.3
R	B	720	475.0	481.5	487.8	494.4	500.9	507.4
R	B	740	474.2	480.6	487.0	493.5	500.0	506.5
R	B	760	473.3	479.7	486.1	492.6	499.1	505.6
R	B	780	472.5	479.0	485.3	491.8	498.3	504.8
R	B	800	471.7	478.1	484.4	490.9	497.4	503.9
R	B	820	470.8	477.2	483.5	490.0	496.5	503.0
R	B	840	470.0	476.4	482.7	489.2	495.7	502.2
R	B	860	469.2	475.6	481.9	488.3	494.8	501.3
R	B	880	468.4	474.8	481.1	487.5	494.0	500.5
R	B	900	468.4	474.8	481.1	487.5	494.0	500.5
R	B	920	468.4	474.8	481.1	487.5	494.0	500.5
R	B	940	468.4	474.8	481.1	487.5	494.0	500.5
R	B	960	468.4	474.8	481.1	487.5	494.0	500.5
R	B	980	468.4	474.8	481.1	487.5	494.0	500.5
R	B	1000	468.4	474.8	481.1	487.5	494.0	500.5
R	B	1020	468.4	474.8	481.1	487.5	494.0	500.5
R	B	1040	468.4	474.8	481.1	487.5	494.0	500.5
R	B	1060	468.4	474.8	481.1	487.5	494.0	500.5
R	B	1080	468.4	474.8	481.1	487.5	494.0	500.5

R B ACCEPTABLE LIMITS - EXHAUST GAS TEMPERATURE (EGT)
R B RATING POINT 97.5 N2/ROOT THETA-20 to 0°C AMBIENT TEMP. T1°C
R B APPENDIX B - TABLE 3 (SHEET 1 of 4)

R B MINIMUM MEASURED EGT (deg C)

R	B	T1 QFE	-8.0	-6.0	-4.0	-2.0	0.0
R	B	700	514.8	521.3	527.9	534.3	540.8
R	B	720	513.9	520.4	526.9	533.3	539.9
R	B	740	512.9	519.5	526.0	532.4	538.9
R	B	760	512.0	518.6	525.1	531.5	538.0
R	B	780	511.2	517.7	524.3	530.6	537.1
R	B	800	510.3	516.8	523.3	529.7	536.2
R	B	820	509.4	515.9	522.4	528.8	535.3
R	B	840	508.6	515.1	521.6	527.9	534.4
R	B	860	507.7	514.2	520.6	527.0	533.5
R	B	880	506.9	513.3	519.8	526.2	532.6
R	B	900	506.9	513.3	519.8	526.2	532.6
R	B	920	506.9	513.3	519.8	526.2	532.6
R	B	940	506.9	513.3	519.8	526.2	532.6
R	B	960	506.9	513.3	519.8	526.2	532.6
R	B	980	506.9	513.3	519.8	526.2	532.6
R	B	1000	506.9	513.3	519.8	526.2	532.6
R	B	1020	506.9	513.3	519.8	526.2	532.6
R	B	1040	506.9	513.3	519.8	526.2	532.6
R	B	1060	506.9	513.3	519.8	526.2	532.6
R	B	1080	506.9	513.3	519.8	526.2	532.6

R B ACCEPTABLE LIMITS - EXHAUST GAS TEMPERATURE (EGT)
R B RATING POINT 97.5 N2/ROOT THETA-20 to 0°C AMBIENT TEMP. T1°C
R B APPENDIX B - TABLE 3 (SHEET 2 of 4)

MAXIMUM MEASURED EGT (deg C)

R	B	T1 QFE	-20.0	-18.0	-16.0	-14.0	-12.0	-10.0
R	B	700	536.5	543.4	550.2	557.3	564.3	571.3
R	B	720	535.5	542.5	549.3	556.3	563.3	570.4
R	B	740	534.6	541.5	548.3	555.3	562.4	569.4
R	B	760	533.7	540.6	547.4	554.4	561.4	568.4
R	B	780	532.8	539.7	546.5	553.5	560.5	567.5
R	B	800	531.9	538.8	545.6	552.6	559.6	566.5
R	B	820	531.0	537.9	544.6	551.6	558.6	565.6
R	B	840	530.1	537.0	543.8	550.7	557.7	564.7
R	B	860	529.2	536.1	542.8	549.8	556.8	563.7
R	B	880	528.3	535.2	542.0	548.9	555.9	562.8
R	B	900	528.3	535.2	542.0	548.9	555.9	562.8
R	B	920	528.3	535.2	542.0	548.9	555.9	562.8
R	B	940	528.3	535.2	542.0	548.9	555.9	562.8
R	B	960	528.3	535.2	542.0	548.9	555.9	562.8
R	B	980	528.3	535.2	542.0	548.9	555.9	562.8
R	B	1000	528.3	535.2	542.0	548.9	555.9	562.8
R	B	1020	528.3	535.2	542.0	548.9	555.9	562.8
R	B	1040	528.3	535.2	542.0	548.9	555.9	562.8
R	B	1060	528.3	535.2	542.0	548.9	555.9	562.8
R	B	1080	528.3	535.2	542.0	548.9	555.9	562.8

R B ACCEPTABLE LIMITS - EXHAUST GAS TEMPERATURE (EGT)
R B RATING POINT 97.5 N2/ROOT THETA-20 to 0°C AMBIENT TEMP. T1°C
R B APPENDIX B - TABLE 3 (SHEET 3 of 4)

R B MAXIMUM MEASURED EGT (deg C)

		T1 QFE	-8.0	-6.0	-4.0	-2.0	0.0
R	B	700	578.2	585.3	592.3	599.2	606.3
R	B	720	577.3	584.3	591.3	598.2	605.3
R	B	740	576.3	583.3	590.3	597.2	604.2
R	B	760	575.3	582.3	589.3	596.2	603.2
R	B	780	574.4	581.4	588.4	595.3	602.3
R	B	800	573.4	580.4	587.4	594.3	601.3
R	B	820	572.4	579.4	586.4	593.3	600.3
R	B	840	571.6	578.5	585.5	592.4	599.4
R	B	860	570.6	577.6	584.5	591.4	598.4
R	B	880	569.7	576.7	583.6	590.5	597.4
R	B	900	569.7	576.7	583.6	590.5	597.4
R	B	920	569.7	576.7	583.6	590.5	597.4
R	B	940	569.7	576.7	583.6	590.5	597.4
R	B	960	569.7	576.7	583.6	590.5	597.4
R	B	980	569.7	576.7	583.6	590.5	597.4
R	B	1000	569.7	576.7	583.6	590.5	597.4
R	B	1020	569.7	576.7	583.6	590.5	597.4
R	B	1040	569.7	576.7	583.6	590.5	597.4
R	B	1060	569.7	576.7	583.6	590.5	597.4
R	B	1080	569.7	576.7	583.6	590.5	597.4

R B ACCEPTABLE LIMITS - EXHAUST GAS TEMPERATURE (EGT)
R B RATING POINT 97.5 N2/ROOT THETA-20 to 0°C AMBIENT TEMP. T1°C
R B APPENDIX B - TABLE 3 (SHEET 4 of 4)

R B MINIMUM FE (kg/h)

		T1 QFE	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00
R	B	700	6692	6732	6772	6811	6852	6891	6931	6971
R	B	720	6874	6915	6956	6996	7038	7079	7119	7161
R	B	740	7055	7097	7139	7181	7223	7265	7307	7349
R	B	760	7234	7277	7320	7363	7407	7450	7492	7536
R	B	780	7410	7454	7498	7541	7586	7630	7674	7718
R	B	800	7582	7627	7672	7717	7762	7807	7852	7898
R	B	820	7753	7799	7845	7890	7937	7983	8029	8075
R	B	840	7925	7972	8019	8066	8113	8160	8207	8255
R	B	860	8097	8145	8193	8241	8290	8337	8385	8434
R	B	880	8269	8318	8367	8416	8466	8515	8564	8613
R	B	900	8450	8500	8550	8600	8650	8701	8751	8801
R	B	920	8639	8690	8741	8792	8844	8895	8946	8997
R	B	940	8827	8880	8932	8984	9037	9089	9141	9194
R	B	960	9017	9070	9123	9176	9230	9284	9337	9391
R	B	980	9205	9260	9314	9368	9423	9478	9532	9569
R	B	1000	9394	9449	9505	9542	9598	9654	9709	9765
R	B	1020	9564	9621	9678	9734	9791	9848	9905	9962
R	B	1040	9754	9811	9869	9926	9985	10043	10101	10159
R	B	1060	9942	10001	10060	10119	10179	10237	10296	10356
R	B	1080	10131	10191	10251	10311	10372	10432	10492	10552

R B ACCEPTABLE LIMITS - ENGINE FUEL FLOW (FE)
R B Rating Point 101.5% N2/root theta - 0 to 30° Ambient Temp T1°C
R B APPENDIX B - TABLE 4 (SHEET 1 OF 4)

MINIMUM FE (kg/h)

		T1	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00
R	B	QFE								
R	B	700	7011	7051	7091	7131	7172	7212	7252	7291
R	B	720	7202	7243	7284	7325	7366	7407	7448	7489
R	B	740	7392	7433	7476	7518	7560	7602	7645	7686
R	B	760	7579	7622	7665	7709	7752	7795	7838	7881
R	B	780	7762	7806	7851	7895	7939	7984	8028	8072
R	B	800	7943	7988	8033	8078	8124	8169	8214	8259
R	B	820	8122	8168	8214	8260	8307	8353	8399	8445
R	B	840	8302	8349	8396	8443	8491	8538	8585	8632
R	B	860	8482	8530	8578	8627	8675	8723	8772	8820
R	B	880	8662	8711	8760	8810	8859	8908	8958	9007
R	B	900	8851	8901	8952	9002	9053	9103	9153	9203
R	B	920	9049	9100	9151	9203	9255	9306	9358	9409
R	B	940	9246	9299	9351	9404	9457	9509	9544	9596
R	B	960	9444	9498	9551	9587	9641	9694	9748	9802
R	B	980	9624	9678	9733	9788	9843	9898	9953	10007
R	B	1000	9821	9877	9933	9989	10045	10101	10157	10213
R	B	1020	10019	10076	10133	10190	10247	10304	10361	10418
R	B	1040	10217	10275	10333	10392	10450	10508	10566	10624
R	B	1060	10415	10474	10533	10593	10652	10711	10771	10830
R	B	1080	10613	10673	10733	10794	10854	10914	10975	11035

R B ACCEPTABLE LIMITS - ENGINE FUEL FLOW (FE)
R B Rating Point 101.5% N2/root theta - 0 to 30° Ambient Temp T1°C
R B APPENDIX B - TABLE 4 (SHEET 2 OF 4)

MAXIMUM FE (kg/h)

		T1 QFE	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00
R	B	700	7333	7375	7418	7460	7503	7546	7588	7631
R	B	720	7527	7571	7614	7657	7702	7745	7789	7833
R	B	740	7721	7765	7810	7854	7900	7945	7990	8035
R	B	760	7912	7958	8004	8049	8096	8142	8188	8234
R	B	780	8099	8146	8193	8240	8288	8335	8382	8429
R	B	800	8283	8332	8380	8427	8476	8524	8572	8621
R	B	820	8466	8515	8565	8613	8663	8713	8762	8812
R	B	840	8650	8701	8751	8801	8852	8902	8952	9003
R	B	860	8835	8886	8937	8988	9041	9092	9143	9195
R	B	880	9019	9071	9124	9176	9229	9282	9334	9387
R	B	900	9212	9266	9320	9373	9427	9481	9534	9588
R	B	920	9415	9469	9524	9578	9634	9689	9744	9799
R	B	940	9617	9673	9729	9784	9841	9897	9953	10010
R	B	960	9819	9877	9934	9991	10049	10106	10163	10221
R	B	980	10022	10080	10139	10196	10256	10314	10373	10450
R	B	1000	10224	10284	10343	10421	10481	10541	10600	10660
R	B	1020	10445	10505	10566	10626	10688	10748	10809	10870
R	B	1040	10647	10709	10771	10832	10895	10957	11019	11081
R	B	1060	10849	10912	10976	11038	11102	11165	11228	11292
R	B	1080	11051	11116	11180	11244	11309	11373	11438	11502

R B ACCEPTABLE LIMITS - ENGINE FUEL FLOW (FE)
R B Rating Point 101.5% N2/root theta - 0 to 30° Ambient Temp T1°C
R B APPENDIX B - TABLE 4 (SHEET 3 OF 4)

R B MAXIMUM FE (kg/h)

		T1 QFE	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00
R	B	700	7674	7716	7759	7802	7845	7887	7930	7973
R	B	720	7877	7921	7965	8009	8053	8097	8141	8184
R	B	740	8080	8125	8170	8215	8260	8305	8350	8395
R	B	760	8280	8326	8372	8419	8465	8511	8558	8603
R	B	780	8476	8523	8571	8618	8666	8713	8761	8807
R	B	800	8669	8717	8766	8815	8863	8911	8960	9008
R	B	820	8861	8910	8960	9009	9059	9108	9158	9207
R	B	840	9054	9104	9155	9205	9256	9307	9357	9408
R	B	860	9247	9298	9350	9402	9453	9505	9557	9608
R	B	880	9440	9492	9545	9598	9651	9704	9757	9809
R	B	900	9642	9696	9750	9804	9858	9912	9966	10020
R	B	920	9854	9909	9964	10019	10075	10130	10185	10240
R	B	940	10066	10122	10178	10235	10291	10348	10423	10478
R	B	960	10278	10335	10393	10469	10527	10584	10642	10699
R	B	980	10508	10567	10625	10684	10743	10802	10861	10919
R	B	1000	10720	10779	10839	10899	10959	11019	11079	11139
R	B	1020	10931	10992	11053	11114	11176	11237	11298	11359
R	B	1040	11144	11206	11268	11330	11393	11455	11518	11579
R	B	1060	11355	11419	11482	11546	11609	11673	11736	11799
R	B	1080	11567	11631	11696	11761	11826	11891	11955	12020

R B ACCEPTABLE LIMITS - ENGINE FUEL FLOW (FE)
R B Rating Point 101.5% N2/root theta - 0 to 30° Ambient Temp T1°C
R B APPENDIX B - TABLE 4 (SHEET 4 OF 4)

R B MINIMUM P7 (psig)

R	B	T1	0.000	2.000	4.000	6.000	8.000	10.000	12.000	14.000
R	B	QFE								
R	B	700	25.302	25.329	25.355	25.380	25.406	25.431	25.453	25.477
R	B	720	26.000	26.028	26.055	26.080	26.107	26.132	26.155	26.179
R	B	740	26.697	26.726	26.753	26.779	26.806	26.832	26.856	26.880
R	B	760	27.387	27.416	27.444	27.471	27.498	27.525	27.549	27.574
R	B	780	28.059	28.089	28.117	28.144	28.173	28.200	28.225	28.250
R	B	800	28.719	28.749	28.778	28.806	28.834	28.862	28.888	28.914
R	B	820	29.374	29.404	29.434	29.462	29.491	29.520	29.546	29.573
R	B	840	30.034	30.065	30.096	30.124	30.154	30.183	30.209	30.237
R	B	860	30.698	30.729	30.760	30.789	30.819	30.848	30.876	30.904
R	B	880	31.362	31.394	31.425	31.455	31.486	31.515	31.543	31.572
R	B	900	32.051	32.084	32.116	32.146	32.177	32.208	32.236	32.266
R	B	920	32.766	32.799	32.831	32.862	32.894	32.925	32.954	32.984
R	B	940	33.486	33.523	33.558	33.591	33.626	33.659	33.689	33.720
R	B	960	34.202	34.239	34.275	34.308	34.343	34.377	34.408	34.439
R	B	980	34.916	34.954	34.990	35.024	35.060	35.094	35.125	35.158
R	B	1000	35.630	35.668	35.706	35.740	35.777	35.811	35.843	35.876
R	B	1020	36.344	36.383	36.421	36.456	36.493	36.528	36.561	36.594
R	B	1040	37.060	37.099	37.137	37.173	37.211	37.247	37.280	37.314
R	B	1060	37.774	37.814	37.853	37.889	37.927	37.964	37.997	38.032
R	B	1080	38.489	38.529	38.569	38.606	38.644	38.682	38.716	38.751

R B ACCEPTABLE LIMITS - JET PIPE PRESSURE (P7)
R B Rating Point 101.5% N2/root theta - 0 to 30°C Ambient Temp T1°C
R B APPENDIX B - TABLE 5 (SHEET 1 OF 4)

R B MINIMUM P7 (psig)

		T1 QFE	16.000	18.000	20.000	22.000	24.000	26.000	28.000	30.000
R	B	700	25.498	25.521	25.544	25.567	25.589	25.612	25.635	25.657
R	B	720	26.201	26.225	26.248	26.271	26.295	26.319	26.341	26.365
R	B	740	26.903	26.928	26.951	26.975	26.999	27.024	27.047	27.071
R	B	760	27.598	27.623	27.647	27.672	27.696	27.721	27.745	27.770
R	B	780	28.275	28.300	28.325	28.350	28.375	28.401	28.425	28.450
R	B	800	28.939	28.965	28.990	29.016	29.041	29.068	29.093	29.119
R	B	820	29.598	29.625	29.651	29.677	29.703	29.730	29.756	29.782
R	B	840	30.263	30.290	30.317	30.343	30.370	30.398	30.424	30.451
R	B	860	30.930	30.958	30.986	31.013	31.040	31.068	31.095	31.123
R	B	880	31.599	31.628	31.655	31.683	31.711	31.740	31.768	31.795
R	B	900	32.293	32.322	32.351	32.379	32.408	32.437	32.465	32.494
R	B	920	33.012	33.042	33.071	33.100	33.130	33.160	33.188	33.234
R	B	940	33.748	33.779	33.808	33.838	33.868	33.899	33.928	33.958
R	B	960	34.468	34.499	34.530	34.560	34.590	34.622	34.652	34.682
R	B	980	35.187	35.219	35.250	35.281	35.312	35.344	35.375	35.406
R	B	1000	35.906	35.939	35.970	36.002	36.034	36.066	36.098	36.129
R	B	1020	36.625	36.658	36.690	36.723	36.755	36.788	36.820	36.852
R	B	1040	37.345	37.379	34.412	37.445	37.478	37.512	37.544	37.577
R	B	1060	38.064	38.098	38.132	38.166	38.199	38.234	38.267	38.300
R	B	1080	38.784	38.819	38.853	38.887	38.921	38.957	38.991	39.025

R B ACCEPTABLE LIMITS - JET PIPE PRESSURE (P7)

R B Rating Point 101.5% N2/root theta - 0 to 30°C Ambient Temp T1°C

R B APPENDIX B - TABLE 5 (SHEET 2 OF 4)

R B MAXIMUM P7 (psig)

		T1 QFE	0.000	2.000	4.000	6.000	8.000	10.000	12.000	14.000
R	B	700	27.836	27.859	27.881	27.902	27.924	27.946	27.971	27.996
R	B	720	28.596	28.620	28.643	28.664	28.687	28.710	28.735	28.761
R	B	740	29.355	29.379	29.403	29.425	29.449	29.472	29.498	29.525
R	B	760	30.106	30.131	30.155	30.178	30.203	30.227	30.254	30.281
R	B	780	30.837	30.863	30.889	30.912	30.937	30.962	30.990	31.018
R	B	800	31.556	31.582	31.608	31.633	31.658	31.684	31.712	31.741
R	B	820	32.269	32.296	32.323	32.348	32.374	32.401	32.429	32.459
R	B	840	32.988	33.016	33.044	33.069	33.097	33.124	33.153	33.183
R	B	860	33.711	33.740	33.768	33.794	33.822	33.850	33.879	33.910
R	B	880	34.434	34.464	34.493	34.520	34.548	34.577	34.607	34.639
R	B	900	35.186	35.216	35.246	35.273	35.303	35.332	35.363	35.395
R	B	920	35.965	35.996	36.026	36.054	36.084	36.114	36.146	36.179
R	B	940	36.738	36.767	36.796	36.823	36.852	36.881	36.913	36.947
R	B	960	37.518	37.548	37.578	37.605	37.635	37.665	37.698	37.733
R	B	980	38.297	38.328	38.359	38.387	38.418	38.448	38.482	38.517
R	B	1000	39.076	39.108	39.139	39.168	39.200	39.321	39.266	39.302
R	B	1020	39.655	39.888	39.920	39.950	39.982	40.014	40.049	40.086
R	B	1040	40.636	40.669	40.702	40.733	40.766	40.799	40.835	40.872
R	B	1060	41.415	41.449	41.483	41.514	41.548	41.582	41.618	41.656
R	B	1080	42.195	42.230	42.265	42.297	42.331	42.366	42.403	42.442

R B ACCEPTABLE LIMITS - JET PIPE PRESSURE (P7)
R B Rating Point 101.5% N2/root theta - 0 to 30°C Ambient Temp T1°C
R B APPENDIX B - TABLE 5 (SHEET 3 OF 4

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R B MAXIMUM P7 (psig)

		T1 QFE	16.000	18.000	20.000	22.000	24.000	26.000	28.000	30.000
R	B	700	28.020	28.045	28.069	28.094	28.119	28.144	28.168	28.193
R	B	720	28.785	28.811	28.836	28.862	28.887	29.913	28.938	28.963
R	B	740	29.550	29.576	29.602	29.628	29.654	29.681	29.707	29.732
R	B	760	30.307	30.334	30.360	30.387	30.414	30.441	30.467	30.494
R	B	780	31.044	31.072	31.099	31.126	31.153	31.182	31.208	31.236
R	B	800	31.768	31.796	31.824	31.852	31.880	31.909	31.936	31.964
R	B	820	32.486	32.516	32.544	32.572	32.601	32.630	32.659	32.687
R	B	840	33.211	33.241	33.270	33.299	33.328	33.358	33.387	33.416
R	B	860	33.939	33.969	33.999	34.029	34.059	34.089	34.119	34.149
R	B	880	34.668	34.699	34.730	34.760	34.790	34.822	34.852	34.882
R	B	900	35.425	35.457	35.488	35.519	35.550	35.582	35.613	35.644
R	B	920	36.210	36.242	36.274	36.306	36.337	36.370	36.402	36.417
R	B	940	36.978	37.012	37.044	37.077	37.109	37.143	37.175	37.207
R	B	960	37.765	37.798	37.832	37.865	37.898	37.932	37.965	37.998
R	B	980	38.550	38.585	38.618	38.652	36.686	38.721	38.755	38.788
R	B	1000	39.335	39.370	39.405	39.439	39.474	39.510	39.544	39.578
R	B	1020	40.120	40.156	40.191	40.226	40.262	40.298	40.333	40.368
R	B	1040	40.907	40.943	40.979	41.015	41.051	41.088	41.124	41.160
R	B	1060	41.692	41.729	41.766	41.802	41.839	41.877	41.913	41.950
R	B	1080	42.478	42.516	42.553	42.591	42.628	42.667	42.703	42.741

R B ACCEPTABLE LIMITS - JET PIPE PRESSURE (P7)

R B Rating Point 101.5% N2/root theta = 0 to 30°C Ambient Temp T1°C

R B APPENDIX B - TABLE 5 (SHEET 4 OF 4)

R B MINIMUM MEASURED EGT (deg C)

R	B	T1 QFE	0.000	2.000	4.000	6.000	8.000	10.000	12.000	14.000
R	B	700	614.0	621.1	628.1	635.2	642.3	649.5	656.5	663.7
R	B	720	613.1	620.2	627.3	634.3	641.5	648.6	655.6	662.8
R	B	740	612.2	619.3	626.3	633.4	640.5	647.6	654.6	661.8
R	B	760	611.3	618.4	625.5	632.5	639.6	646.7	653.8	660.9
R	B	780	610.5	617.5	624.6	631.6	638.7	645.9	652.9	660.0
R	B	800	609.6	616.7	623.8	630.8	637.9	645.0	650.2	659.1
R	B	820	608.8	615.8	622.9	629.9	637.0	644.1	651.1	658.2
R	B	840	607.9	615.0	622.0	629.0	636.1	643.2	650.2	657.3
R	B	860	607.1	614.1	621.2	628.2	635.3	642.3	649.3	656.4
R	B	880	606.3	613.3	620.3	627.3	634.4	641.5	648.4	655.5
R	B	900	605.9	612.9	619.9	626.9	634.0	641.1	648.0	655.1
R	B	920	605.9	612.9	619.9	626.9	634.0	641.1	648.0	655.1
R	B	940	605.9	612.9	619.9	626.9	634.0	641.1	648.0	655.1
R	B	960	605.9	612.9	619.9	626.9	634.0	641.1	648.0	655.1
R	B	980	605.9	612.9	619.9	626.9	634.0	641.1	648.0	655.1
R	B	1000	605.9	612.9	619.9	626.9	634.0	641.1	648.0	655.1
R	B	1020	605.9	612.9	619.9	626.9	634.0	641.1	648.0	655.1
R	B	1040	605.9	612.9	619.9	626.9	634.0	641.1	648.0	655.1
R	B	1060	605.9	612.9	619.9	626.9	634.0	641.1	648.0	655.1
R	B	1080	605.9	612.9	619.9	626.9	634.0	641.1	648.0	655.1

R B ACCEPTABLE LIMITS - EXHAUST GAS TEMPERATURE (EGT)
R B Rating Point 101.5% N2/root theta - 0 to 30°C Ambient Temp T1°C
R B APPENDIX B - TABLE 6 (SHEET 1 OF 4)

R B MINIMUM MEASURED EGT (deg C)

		T1 QFE	16.000	18.000	20.000	22.000	24.000	26.000	28.000	30.000
R	B	700	670.8	677.9	685.1	692.2	699.4	706.6	713.8	720.9
R	B	720	669.9	677.0	684.2	691.3	698.4	705.7	712.8	719.9
R	B	740	668.9	676.0	683.2	690.3	697.4	704.6	711.8	718.9
R	B	760	668.0	675.1	682.2	689.4	696.5	703.7	710.8	717.9
R	B	780	667.1	674.2	681.3	688.4	695.6	702.8	709.9	717.0
R	B	800	666.2	673.3	680.4	687.5	694.6	701.8	708.9	716.0
R	B	820	665.3	672.4	679.5	686.6	693.7	700.9	708.0	715.1
R	B	840	664.4	671.5	678.6	685.7	692.8	700.0	707.1	714.1
R	B	860	663.5	670.6	677.7	684.8	691.8	699.0	706.1	713.2
R	B	880	662.6	669.7	676.8	683.8	690.9	698.1	705.2	712.3
R	B	900	662.2	669.3	676.4	683.4	690.5	697.7	704.8	711.8
R	B	920	662.2	669.3	676.4	683.4	690.5	697.7	704.8	711.8
R	B	940	662.2	669.3	676.4	683.4	490.5	697.7	704.8	711.8
R	B	960	662.2	669.3	676.4	683.4	690.5	697.7	704.8	711.8
R	B	980	662.2	669.3	676.4	683.4	690.5	697.7	704.8	711.8
R	B	1000	662.2	669.3	676.4	683.4	690.5	697.7	704.8	711.8
R	B	1020	662.2	669.3	676.4	683.4	690.5	697.7	704.8	711.8
R	B	1040	662.2	669.3	676.4	683.4	690.5	697.7	704.8	711.8
R	B	1060	662.2	669.3	676.4	683.4	690.5	697.7	704.8	711.8
R	B	1080	662.2	669.3	676.4	683.4	690.5	697.7	704.8	711.8

R B ACCEPTABLE LIMITS - EXHAUST GAS TEMPERATURE (EGT)
R B Rating Point 101.5% N2/root theta - 0 to 30°C Ambient Temp T1°C
R B APPENDIX B - TABLE 6 (SHEET 2 OF 4)

R B MAXIMUM MEASURED EGT (deg C)

R	B	T1 QFE	0.000	2.000	4.000	6.000	8.000	10.000	12.000	14.000
R	B	700	669.8	677.4	684.9	692.4	700.0	707.6	715.0	722.6
R	B	720	668.9	676.5	684.0	691.5	699.0	706.6	714.1	721.7
R	B	740	667.9	675.4	683.0	690.4	698.0	705.6	713.1	720.6
R	B	760	667.0	674.5	682.0	689.5	697.1	704.6	712.1	719.7
R	B	780	666.1	673.6	681.1	688.6	696.2	703.7	711.2	718.7
R	B	800	665.2	672.7	680.2	687.7	695.2	702.8	710.2	717.8
R	B	820	664.3	671.8	679.3	686.8	694.3	701.8	709.3	716.8
R	B	840	663.4	670.9	678.4	685.8	693.4	700.9	708.3	715.9
R	B	860	662.5	670.0	677.5	684.9	692.4	700.0	707.4	714.9
R	B	880	661.6	669.1	676.6	684.0	691.5	699.0	706.5	714.0
R	B	900	661.2	668.7	676.2	683.6	691.1	698.6	706.0	713.6
R	B	920	661.2	668.7	676.2	683.6	691.1	698.6	706.0	713.6
R	B	940	661.2	668.7	676.2	683.6	691.1	698.6	706.0	713.6
R	B	960	661.2	668.7	676.2	683.6	691.1	698.6	706.0	713.6
R	B	980	661.2	668.7	676.2	683.6	691.1	698.6	706.0	713.6
R	B	1000	661.2	668.7	676.2	683.6	691.1	698.6	706.0	713.6
R	B	1020	661.2	668.7	676.2	683.6	691.1	698.6	706.0	713.6
R	B	1040	661.2	668.7	676.2	683.6	691.1	698.6	706.0	713.6
R	B	1060	661.2	668.7	676.2	683.6	691.1	698.6	706.0	713.6
R	B	1080	661.2	668.7	676.2	683.6	691.1	698.6	706.0	713.6

R B ACCEPTABLE LIMITS - EXHAUST GAS TEMPERATURE (EGT)
R B Rating Point 101.5% N2/root theta - 0 to 30°C Ambient Temp T1°C
R B APPENDIX B - TABLE 6 (SHEET 3 OF 4)

R B MAXIMUM MEASURED EGT (deg C)

		T1 QFE	16.000	18.000	20.000	22.000	24.000	26.000	28.000	30.000
R	B	700	730.2	737.8	745.4	753.0	760.6	768.3	775.9	783.5
R	B	720	729.3	736.9	744.4	752.0	759.6	767.3	774.9	782.5
R	B	740	728.2	735.8	743.4	750.9	758.5	766.2	773.8	781.4
R	B	760	727.2	734.8	742.4	750.0	757.5	765.2	772.8	780.3
R	B	780	726.3	733.9	741.4	749.0	756.5	764.2	771.8	779.3
R	B	800	725.3	732.9	740.4	748.0	755.6	763.2	770.8	778.3
R	B	820	724.4	731.9	739.5	747.0	754.6	762.2	769.8	777.3
R	B	840	723.4	731.0	738.5	746.0	753.6	761.2	768.8	776.3
R	B	860	722.5	730.0	737.5	745.1	752.6	760.2	767.8	775.3
R	B	880	721.5	729.0	736.6	744.1	751.6	759.2	766.8	774.3
R	B	900	721.1	728.6	736.1	743.7	751.2	758.8	766.3	773.8
R	B	920	721.1	728.6	736.1	743.7	751.2	758.8	766.3	773.8
R	B	940	721.1	728.6	736.1	743.7	751.2	758.8	766.3	773.8
R	B	960	721.1	728.6	736.1	743.7	751.2	758.8	766.3	773.8
R	B	980	721.1	728.6	736.1	743.7	751.2	758.8	766.3	773.8
R	B	1000	721.1	728.6	736.1	743.7	751.2	758.8	766.3	773.8
R	B	1020	721.1	728.6	736.1	743.7	751.2	758.8	766.3	773.8
R	B	1040	721.1	728.6	736.1	743.7	751.2	758.8	766.3	773.8
R	B	1060	721.1	728.6	736.1	743.7	751.2	758.8	766.3	773.8
R	B	1080	721.1	728.6	736.1	743.7	751.2	758.8	766.3	773.8

R B ACCEPTABLE LIMITS - EXHAUST GAS TEMPERATURE (EGT)
R B Rating Point 101.5% N2/root theta - 0 to 30°C Ambient Temp T1°C
R B APPENDIX B - TABLE 6 (SHEET 4 OF 4)

R B MINIMUM FE (Kg/h)

R	B	T1 QFE	30.000	32.000	34.000	36.000	38.000	40.000
R	B	700	6855	6892	6930	6968	7006	7004
R	B	720	7040	7079	7118	7157	7196	7235
R	B	740	7224	7264	7304	7344	7384	7424
R	B	760	7408	7449	7490	7531	7572	7613
R	B	780	7588	7630	7672	7714	7756	7798
R	B	800	7765	7808	7850	7894	7936	7979
R	B	820	7940	7984	8027	8071	8115	8159
R	B	840	8114	8158	8203	8248	8293	8338
R	B	860	8288	8334	8379	8425	8471	8517
R	B	880	8463	8510	8556	8603	8650	8696
R	B	900	8646	8694	8741	8789	8837	8884
R	B	920	8837	8886	8934	8983	9032	9080
R	B	940	9030	9079	9129	9179	9228	9278
R	B	960	9222	9273	9324	9375	9425	9476
R	B	980	9415	9467	9519	9552	9604	9656
R	B	1000	9590	9643	9696	9749	9802	9855
R	B	1020	9783	9837	9891	9945	9999	10053
R	B	1040	9977	10032	10086	10142	10197	10252
R	B	1060	10170	10226	10282	10338	10394	10450
R	B	1080	10363	10420	10477	10535	10592	10649

R B ACCEPTABLE LIMITS - ENGINE FUEL FLOW (FE)
R B Rating Point 100% N2/root theta - 0 to 30° Ambient Temp T1°C
R B APPENDIX 2 - TABLE 7 (SHEET 1 OF 2)

R B MAXIMUM FE (Kg/h)

R	B	T1 QFE	30.000	32.000	34.000	36.000	38.000	40.000
R	B	700	7506	7546	7587	7628	7668	7708
R	B	720	7704	7745	7787	7829	7870	7912
R	B	740	7901	7943	7986	8029	8072	8114
R	B	760	8097	8141	8185	8229	8272	8316
R	B	780	8290	8335	8379	8424	8469	8514
R	B	800	8479	8525	8570	8617	8662	8708
R	B	820	8666	8713	8760	8807	8854	8901
R	B	840	8852	8900	8948	8996	9044	9092
R	B	860	9039	9088	9137	9186	9235	9284
R	B	880	9226	9276	9326	9376	9426	9476
R	B	900	9422	9473	9524	9576	9627	9678
R	B	920	9627	9679	9731	9784	9836	9888
R	B	940	9833	9886	9940	9993	10046	10100
R	B	960	10040	10094	10149	10203	10258	10312
R	B	980	10247	10302	10358	10432	10487	10543
R	B	1000	10472	10529	10585	10642	10699	10755
R	B	1020	10679	10737	10794	10852	10910	10968
R	B	1040	10886	10945	11003	11063	11121	11180
R	B	1060	11093	11152	11212	11273	11333	11393
R	B	1080	11300	11361	11422	11483	11544	11605

R B ACCEPTABLE LIMITS - ENGINE FUEL FLOW (FE)
R B Rating Point 100% N2/root theta - above 30° Ambient Temp T1°C
R B APPENDIX 2 - TABLE 7 (SHEET 2 OF 2)

R B MINIMUM P7 (psig)

R	B	T1 QFE	30.000	32.000	34.000	36.000	38.000	40.000
R	B	700	24.570	24.589	24.611	24.632	24.653	24.674
R	B	720	25.245	25.265	25.287	25.309	25.330	25.352
R	B	740	25.919	25.939	25.962	25.985	26.007	26.030
R	B	760	26.590	26.611	26.635	26.658	26.681	26.704
R	B	780	27.244	27.266	27.290	27.314	27.338	27.361
R	B	800	27.886	27.908	27.933	27.958	27.982	28.006
R	B	820	28.518	28.541	28.566	28.592	28.616	28.641
R	B	840	29.147	29.170	29.197	29.222	29.248	29.273
R	B	860	29.783	29.807	29.834	29.860	29.886	29.912
R	B	880	30.420	30.445	30.473	30.500	30.527	30.554
R	B	900	31.079	31.104	31.132	31.160	31.187	31.215
R	B	920	31.761	31.787	31.816	31.844	31.872	31.900
R	B	940	32.453	32.480	32.510	32.539	32.567	32.596
R	B	960	33.146	33.173	33.204	33.251	33.281	33.311
R	B	980	33.855	33.884	33.915	33.946	33.976	34.007
R	B	1000	34.547	34.577	34.609	34.640	34.671	34.702
R	B	1020	35.239	35.269	35.302	35.334	35.366	35.398
R	B	1040	35.931	35.962	35.995	36.028	36.060	36.093
R	B	1060	36.624	36.655	36.689	36.723	36.756	36.789
R	B	1080	37.316	37.348	37.383	37.417	37.451	37.485

R B ACCEPTABLE LIMITS - JET PIPE PRESSURE (P7)
R B Rating Point 100% N2/root theta - above 30° Ambient Temp T1°C
R B APPENDIX B - TABLE 8 (SHEET 1 OF 2)

R B MAXIMUM P7 (psig)

		T1 QFE	30.000	32.000	34.000	36.000	38.000	40.000
R	B	700	27.018	27.046	27.074	27.101	27.129	27.156
R	B	720	27.753	27.782	27.810	27.838	27.866	27.894
R	B	740	28.487	28.517	28.546	28.575	26.603	28.632
R	B	760	29.216	29.248	29.278	29.307	29.337	29.366
R	B	780	29.931	29.962	29.992	30.022	30.052	30.082
R	B	800	30.630	30.662	30.693	30.723	30.754	30.784
R	B	820	31.319	31.351	31.383	31.414	31.445	31.477
R	B	840	32.005	32.037	32.070	32.102	32.133	32.165
R	B	860	32.698	32.731	32.764	32.797	32.829	32.862
R	B	880	33.394	33.427	33.461	33.494	33.527	33.560
R	B	900	34.112	34.146	34.180	34.214	34.248	34.281
R	B	920	34.856	34.890	34.926	34.960	34.994	35.029
R	B	940	35.611	35.847	35.082	35.718	35.752	35.788
R	B	960	36.367	36.403	36.439	36.458	36.493	36.529
R	B	980	37.107	37.143	37.180	37.217	37.253	37.280
R	B	1000	37.863	37.900	37.938	37.975	38.011	38.048
R	B	1020	38.619	38.657	38.695	38.733	38.770	38.808
R	B	1040	39.375	39.413	39.452	39.490	39.528	39.567
R	B	1060	40.132	40.171	40.210	40.249	40.288	40.327
R	B	1080	40.888	40.927	41.968	41.008	41.047	41.087

R B ACCEPTABLE LIMITS - JET PIPE PRESSURE (P7)
R B Rating Point 100% N2/root theta - above 30° Ambient Temp T1°C
R B APPENDIX B - TABLE 8 (SHEET 2 OF 2)

R B MINIMUM MEASURED EGT (deg C)

		T1 QFE	30.000	32.000	34.000	36.000	38.000	40.000
R	B	700	683.9	690.8	697.9	704.8	711.8	718.8
R	B	720	683.0	689.9	696.9	703.8	710.9	717.8
R	B	740	681.9	688.8	695.9	702.8	709.8	716.7
R	B	760	681.0	687.9	694.9	701.8	708.8	715.7
R	B	780	680.0	686.9	693.9	700.8	707.8	714.8
R	B	800	679.0	685.9	692.9	699.8	706.8	713.7
R	B	820	678.0	684.9	691.9	698.8	705.8	712.7
R	B	840	677.1	683.9	690.9	697.8	704.8	711.7
R	B	860	676.1	683.0	690.0	696.9	703.8	710.7
R	B	880	675.2	682.0	689.0	695.9	702.9	709.7
R	B	900	674.7	681.6	688.6	695.5	702.4	709.3
R	B	920	674.7	681.6	688.6	695.5	702.4	709.3
R	B	940	674.7	681.6	688.6	695.5	702.4	709.3
R	B	960	674.7	681.6	688.6	695.5	702.4	709.3
R	B	980	674.7	681.6	688.6	695.5	702.4	709.3
R	B	1000	674.7	681.6	688.6	695.5	702.4	709.3
R	B	1020	674.7	681.6	688.6	695.5	702.4	709.3
R	B	1040	674.7	681.6	688.6	695.5	702.4	709.3
R	B	1060	674.7	681.6	688.6	695.5	702.4	709.3
R	B	1080	674.7	681.6	688.6	695.5	702.4	709.3

R B ACCEPTABLE LIMITS - EXHAUST GAS TEMPERATURE (EGT)
R BRATING POINT 100% N2/ROOT THETA - ABOVE 30°C AMBIENT TEMP T1°C
R B APPENDIX B - TABLE 9 (SHEET 1 of 2)

			MAXIMUM MEASURED EGT (deg C)					
R	B	T1	30.000	32.000	34.000	36.000	38.000	40.000
R	B	QFE						
R	B	700	746.5	753.9	761.4	768.8	776.3	783.7
R	B	720	745.5	752.9	760.4	767.8	775.3	782.7
R	B	740	744.4	751.8	759.3	766.6	774.1	781.5
R	B	760	743.4	750.8	758.2	765.6	773.1	780.4
R	B	780	742.4	749.7	757.2	764.6	772.0	779.4
R	B	800	741.3	748.6	756.1	763.4	770.9	778.2
R	B	820	740.2	747.6	755.0	762.4	769.8	777.2
R	B	840	739.2	746.6	754.0	761.4	768.8	776.1
R	B	860	738.2	745.6	753.0	760.3	767.8	775.1
R	B	880	737.2	744.5	752.0	759.3	766.7	774.0
R	B	900	736.8	744.1	751.5	758.8	766.3	773.6
R	B	920	736.8	744.1	751.5	758.8	766.3	773.6
R	B	940	736.8	744.1	751.5	758.8	766.3	773.6
R	B	960	736.8	744.1	751.5	758.8	766.3	733.6
R	B	980	736.8	744.1	751.5	758.8	766.3	773.6
R	B	1000	736.8	744.1	751.5	758.8	766.3	773.6
R	B	1020	736.8	744.1	751.5	758.8	766.3	773.6
R	B	1040	736.8	744.1	751.5	758.8	766.3	773.6
R	B	1060	736.8	744.1	751.5	758.8	766.3	773.6
R	B	1080	736.8	744.1	751.5	758.8	766.3	773.6

R B ACCEPTABLE LIMITS - EXHAUST GAS TEMPERATURE (EGT)
R BRATING POINT 100% N2/ROOT THETA - ABOVE 30°C AMBIENT TEMP T1°C
R B APPENDIX B - TABLE 9 (SHEET 2 of 2)

POWER PLANT - INSPECTION/CHECK

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00, SERVICING ALSO THE HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 29-00-00, SERVICING.
WHEN ENTERING THE ENGINE AIR INTAKE AND THE TWIN SECONDARY
NOZZLE FOLLOW THE PROCEDURES GIVEN IN 71-00-00, SERVICING.

RB CAUTION: AIRCRAFT G-BOAE ONLY - FOLLOWING ENGINE SURGE INSPECT REAR RAMP HINGE POST IN ENGINE AIR INTAKE NO.3 IN RB ACCORDANCE WITH NDT TECHNIQUE K54-E-24.

RB READ THE FOLLOWING INFORMATION REGARDING THE USE OF BORESCOPE EQUIPMENT. THIS OUTLINES HOW THESE MAY AFFECT SAFETY AND THEIR CLASSIFICATION RELATIVE TO OUR PROCEDURES. THE PRECAUTIONS LISTED MUST BE COMPLIED WITH.

RB Background & Description

RB Borescope inspections of internal engine components are frequently carried out. These inspections, when conducted with equipment utilising a light source box, now require additional precautions to be taken to eliminate risk of hazard when used in an environment potentially containing combustible gases.

RB Engines installed or near an aircraft, inside or outside a hangar, fall within the compass of this environment. Uninstalled engines in workshops may also be in a hazardous environment.

RB These environments are termed "Zone 2" areas but dedicated Zone 2 certification for equipment is not granted by the Regulatory Authority and it is deemed "UNCERTIFIED EQUIPMENT".

RB A borescope kit comprises several pieces of equipment but it is only the high intensity light source box which is of concern. Existing boxes (Uncertified Equipment) display a warning notice stating it must not be used in the presence of combustible gases.

RB Conditions of use of such equipment in a Zone 2 area in strict accordance with procedures (i.e. using gas monitors, etc.) would impose a considerable maintenance/operational burden.

RB An acceptable relaxation of this situation has been agreed following consultation/borescope demonstration with the Fire Protection Department; although relaxed, adequate safety standards and legal aspects are maintaned provided the following precautions are adhered to.

RB Engines, Installed or near an aircraft

RB 1. Check aircraft fuel log to ensure it has not uplifted a wide cut fuel (Jet B) during the previous 20 hours of operation.

RB 2. Aircraft must not be transferring fuel.

RB 3. Working inside aircraft fuel tanks must not be in progress.

RB 4. Flammable Liquids with a flash point below 90°F (32°C) must not be used within the Remotely High Risk Area - as defined in Section 5.2, EDP-P-FIRE 4.

RB 5. Spraying or use of Petroleum Based Adhesives must not be permitted.

RB 6. Liquid Petroleum Gases must not be used within the Remotely High Risk area.

RB 7. If highly flammable liquids are present and "Uncertified Equipment" needs to be used or if any of the above conditions cannot be met, then Section 5.3 of EDP-P-FIRE 4 must be vigilantly followed.

RB 8. Where applicable, Bonding must take place.

RB Engines in Workshops

RB 1. Conditions (4), (5), (6) & (7) apply.

NOTE : The following checks must be carried out after each report of an engine surge.

Due to the probability of an interactive surge at M1.5 or above, the Inspection/Check must also be accomplished on the adjacent power plant.

1. General

Prior to carrying out an Inspection/Check after engine shut-down the cause of the engine shut-down must be ascertained and rectified in accordance with the appropriate Trouble Shooting topics in Chapter 71. The conditions which require a mandatory shut-down (pulling of the emergency shut-down handle) are:

Low engine oil pressure
Torching flame (ultra-violet) detection
Engine bay fire detection
Engine internal overheat
Engine cooling air overheat (Diagnosis of this failure

must include a check on the temperature datum of the turbine cooling air amplifier Ref. 77-22-00).
For inspections required on the power plant following a heavy landing, and before engine reactivation following a three engine ferry, refer to 5-51-13 and 71-00-00, Removal/Installation respectively.

2. Inspection/Check for Foreign Object Damage (F.O.D)

CAUTION : F.O.D. INSPECTION MUST INCLUDE INSPECTION OF THE ENGINE AIR INTAKE 'OPEN AREAS' (REF. 54-00-00, INSPECTION/CHECK) FOR DEBRIS AND DAMAGE.

A. Equipment and Materials

DESCRIPTION	PART NO
Endoscope	-
Protective rubber mat 0.25 in (7 mm) thick	-

B. Prepare to Inspect

(1) Carry out the procedure for entering the engine air intake, and that for entering the twin secondary nozzle and jet pipe, but do not position the engine intake cover on the engine face (Ref. 71-00-00, Servicing).

(2) Ensure that the ground air start vehicle is disconnected from the nacelle under inspection.

(3) Position a protective mat on the floor of the diffuser.

C. Inspect.

WARNING: OBSERVE THE SAFETY PRECAUTIONS WHEN ENTERING THE ENGINE AIR INTAKE.

CAUTION: FOREIGN OBJECT DAMAGE TO THE ENGINE INTERIOR MAY OCCUR IRRESPECTIVE OF ENGINE AIR INTAKE CONDITION.

(1) Enter the engine air intake:

(a) At the engine compressor face visually examine the intake vanes and compressor blades for cracks and damage. Also check the LP compressor for freedom of rotation. If damage is found, continue the inspection as follows:

a1) Vacate the engine air intake, and examine the LP compressor stage 7 and HP
R compressor stages 2, 3 and 7 for cracks and damage (Ref.72-31-00 and 72-33-00, Inspection/Check).

a2) Check for evidence of blade tip rubs.

a3) If further damage is found, examine the remaining unexamined stages of the LP and HP compressors for cracks and damage (Ref. 72-31-00 and 72-33-00, Inspection/Check). Also examine the atomizing nozzle stems for cracks and damage by way of the combustion chamber examination ports (Ref.72-41-01, Inspection/Check).

(b) Inspect the engine air intake, particularly the diffuser, and the de-iced areas of the intake (Ref.30-11-00) for damage.

(continued on page 603)

(c) Check all parts in the intake for security, particularly access panels, front and rear ramps, ramp actuator and associated hydraulic pipes and electrical cables, and the T1 probe.

(d) Ensure that the air conditioning duct intake and the T1 probe are clear.

(e) Insert an endoscope into the air conditioning duct intake and visually examine the seal and support of the cooling air change-over flap for damage and security.

(f) Move the auxiliary air intake vane through its full range of movement. Check that the movement is unrestricted.

(2) Enter the twin secondary nozzle and jet pipe:

WARNING: OBSERVE THE SAFETY PRECAUTIONS FOR ENTERING THE TWIN SECONDARY NOZZLE.

NOTE: Operation (a) need be completed only if engine interior damage has been found during operations above.

(a) At the turbine face, carry out a visual and tactile examination for damage of the LP turbine nozzles and rotor blades. If damage is found, inspect the HP rotor blades (Ref. 72-51-00, Inspection/Check).

(b) Inspect the inner face of the jet pipe, reheat spray ring, primary nozzle convergent divergent nozzle and the thrust reverser buckets for damage.

(c) Check the primary nozzle petals for security and damage.

D. Conclusion

(1) Remove the protective mat from the floor of the diffuser.

(2) Carry out the procedures for vacating the engine air intake and the twin secondary nozzle (Ref. 71-00-00, Servicing).

R 3. Action to be Taken on Air-Washed Systems Following Removal of a
R Failed Engine

R A. When the engine removal is associated with an internal failure,
R it is possible that systems supplied by P3 air could become
R contaminated by debris. As a result of this, the following
R systems, including any protective filters, should be checked.

R (1) Primary nozzle control system (Ref. 76-13-00).

R (2) Thrust reverser system (Ref. 78-30-00).

R (3) Air conditioning system (Ref. 21-00-00).

R 4. Action to be Taken Following an Engine Overtemperature

A. When it has been established that an acceptable engine overtemperature, has occurred, subject to inspection (Ref. 71-00-34, Trouble Shooting), carry out inspection detailed in para. B. and ascertain the engine fitness for further service.

If the maximum overtemperature limit has been exceeded, remove the engine for rectification as detailed in the Heavy Maintenance or Overhaul manuals.

B. Inspect Engine for signs of Overheating, Buckling and spalling of Aluminide Coatings.

(1) Inspect HP turbine blades and nozzle guide vanes (Ref. 72-51-00).

(2) Carry out a visual and tactile examination of the following components.

(a) LP turbine blades, nozzle guide vanes, exhaust diffuser and reheat system.

(b) Spherical joint flange and jet pipe.

(c) If signs of overheating, buckling or severe spalling of aluminide coatings exist, remove the engine or component for rectification.

C. Trace and rectify any fault that has caused an overtemperature.

R 5. Inspection/Check After Engine Surge

NOTE: The Inspection/Check of the engine air intake must be carried out after each report of an engine surge.

The amount of engine inspection is a matter for investigation as indicated.

Due to the probability of an interactive surge at M1.5 or above, the Inspection/Check must also be accomplished on the adjacent power plant.

The (Eddysonic) NDT requirement for front and rear ramps may be deferred until the aircraft returns to main base, provided that at the station immediately following the surge incident, the ramps are checked by tap testing.

A. Equipment and Materials

R

DESCRIPTION	PART NO.
Protective rubber mat, 0.25 in (7 mm) thick	-
Torque spanner, range 0-70 lbf in (0-0.79 mdaN)	-
Torque spanner, range 0-350 lbf in (0-3.95 mdaN)	-
R Corrosion resistant steel wire, 0.031 in (0.8 mm) dia	DTD189A
High temperature resistant nimonic wire, 0.031 in (0.8 mm) dia.	DTD747
Feeler gauges	-

B. Prepare to Inspect

(1) Open the spill door (Ref. 71-64-00, Inspection/Check) and lower the ramps fully (Ref. 71-63-00, Servicing).

(2) Remove the access panels covering the spill door hinge brackets, as appropriate:

No. 1 Intake	411FL, 411KB, 411JB, 411HB
No. 2 Intake	421FR, 421KB, 421JB, 421HB
No. 3 Intake	431FL, 431KB, 431JB, 431HB
No. 4 Intake	441FR, 441KB, 441JB, 441HB

(3) Carry out the procedure for entering the engine air intake, but do not position the engine intake cover on the engine face (Ref. 71-00-00, Servicing).

(4) Position a protective mat in the intake below the ramps.

C. Inspect Engine Air Intake

<u>WARNING</u>: OBSERVE THE SAFETY PRECAUTIONS WHEN ENTERING THE ENGINE AIR INTAKE.

<u>NOTE</u>: When the aircraft is away from base, delamination of the ramp structure may be investigated by tap testing. This should be followed up by the full NDT procedure on return to base and, subject to a tap check of the ramps for delamination on arrival at the station immediately following the surge. The tap check should cover the whole area of the ramp top and bottom surfaces. The NDT check, however, may be reduced in area. This check being confined to the upper and lower surfaces of the ramps over an area extending for 11 inches aft of the link centreline for the rear ramps, and between 15 and 28 inches forward of the link centreline for the front ramps

(1) Enter the engine air intake:

(a) Using a suitable mechanical impedance tester or ultrasonic flaw detector check the forward and rear ramps for delamination of skin from honeycomb core (Ref. NDT Part 4 54-21-03 or 54-21-06 or 54-21-08 or Part 5 54-21-07 or 54-21-08).

(b) Check the taper pins which secure the levers to the ramp torque tubes for security.

<u>NOTE</u>: Design torque load is between 60 and 70 lbf in (0.68 and 0.79 mdaN) for the attaching nuts.

(c) Visually examine the ramp torque tube bellows for circumferential cracks in the region of their attachments.

(d) Visually examine the bearing housings, which secure the ramp torque tubes to the intake structure, for cracks particularly in the vicinity of the attachment bolts.

(e) Check the bolts which secure the ramp torque tube centre bearings to the lower flange of the frame for security.

<u>NOTE</u>: Design torque load is between 145 and 160 lbf in (1.64 and 1.81 mdaN). Also visually examine the frame lower flange for cracks.

(f) Visually examine the ramp actuator casing and attaching parts to the structure for cracks and security.

(g) In areas above the ramps, check all equipment mounting brackets for security.

(h) Check the diffuser skin attachment rivets for security.

RB (j) Visually inspect air intake roof skin (lower skin
RB of bleed floor) for edge damage, caused by ramp
RB torque tube lever arms. Repair in accordance
RB with SRM 54-11-00 as required.

(2) From outside the engine intake:

(a) With the spill door open, check the bolts securing the vertical push-rod attachment brackets to the door for security.

<u>NOTE</u>: Design torque loads are:
Hexagon head bolts - between 60 and 70 lbf in (0.68 and 0.79 mdaN).
12 point head bolts - between 275 and 310 lbf in (3.11 and 3.5 mdaN). The 12 point head bolts are wire locked.

For access to the 12 point head bolts it is necessary to disconnect and reconnect each spill door push rod in turn (Ref. 71-64-12, Removal/Installation).

(b) Inspect the spill door side boxes in the vicinity of the push-rod attachment brackets for cracks. Also inspect sidewall sidebox curved skins for signs of buckling.

(c) Visually examine the spill door hinges for cracks.

(d) Manually open the auxiliary air intake vane, and visually examine the side box structures, in the region of the vane stop brackets, for cracks.

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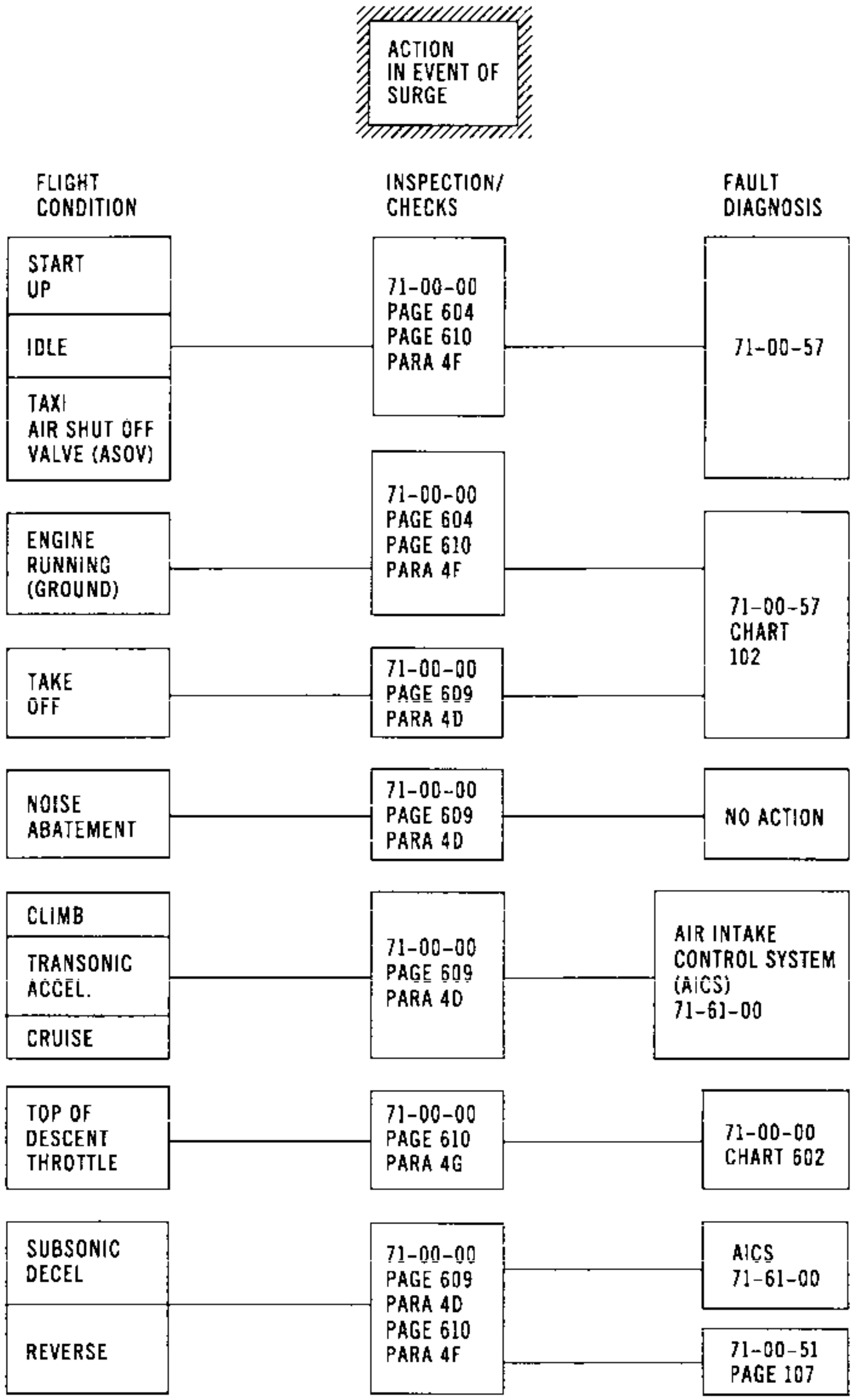

Chart 601

D. Inspection of Engine After In-Flight Surge (Charts 601 and 602).

CAUTION: INSPECTION OF THE AIR INTAKE MUST BE SATISFACTORILY COMPLETED (REF. PARA.4C).

(1) After an engine surge in flight which has not occurred during noise abatement power reduction, the following checks of the engine must be made before the engine is cleared for further flight.

(a) Examine the following for cracks and damage:

LP compressor stage 7 (Ref. 72-31-03 Inspection/Check)
HP compressor stages 2, 3 and 7 (Ref. 72-33-02 Inspection/Check)
R LP turbine blades (Ref. 72-52-00 Inspection/Check)
R HP turbine blades (Ref. 72-51-00 Inspection/Check)
LP turbine nozzles (As far as possible) (Ref. 72-51-00, Inspection/Check)
HP turbine nozzles (As far as possible) (Ref. 72-52-00, Inspection/Check)

(b) If damage is found, carry out the following examination procedures:

b1) LP and HP compressors - examine the remaining, unexamined stages for cracks or damage (Ref. 72-31-00 and 72-33-00, Inspection/Check).

b2) Atomizing nozzle assemblies - examine the nozzle stems for cracks or damage by way of combustion chamber examination ports (Ref. 72-41-01, Inspection/Check).

E. Inspection of Engine When Surge has Occurred During Noise Abatement Power Reduction.

CAUTION: INSPECTION OF THE AIR INTAKE MUST BE SATISFACTORILY COMPLETED (REF.PARA.4C).

(1) After an engine surge during noise abatement power reduction, whether engine anti-icing was operating or not, the engine can be cleared for further flight provided that:

(a) All engine parameters on all engines were normal and consistent for the remainder of the flight after the surge.

(b) The examination procedures given in operation (2) disclose no defects.

(2) Carry out a check for engine damage:

<u>WARNING:</u> DO NOT ENTER AIR INTAKE WHEN AIRCRAFT POWER IS AVAILABLE.

(a) Prepare the aircraft air intake and the twin secondary nozzle for entry (Ref.71-00-00, Servicing).

(b) Enter the air intake and visually examine the LP compressor for signs of damage.

(c) Enter the twin secondary nozzle and carry out a visual and tactile examination of the LP turbine and jet pipe.

(d) If damage is found, carry out the combines examination procedures detailed in paragraph D.(1)(a) and (b).

F. Action When Engine Surge has Occurred on the Ground.

(1) If engine surge has occurred above idle, carry out the checks specified in paragraph 4.D.

(2) If engine surge has occurred at or below idle (including systems checking), where the surge is of a relatively minor nature and subsequent engine operation is normal, there is no inspection requirement. The cause of the surge however, should be investigated at the earliest convenient opportunity.

G. Action when surge has occurred during aircraft deceleration at the end of Mn 2.0 cruise - Top of Descent (TOD).

(1) If the surge had been reported as a "soft" pop surge, the engine can be cleared for flight pending:

(a) All engine parameters were normal and consistent for the remainder of the flight after the surge.

(b) The examination procedures given in paragraph E.(2) disclose no defects.

(c) Peak EGT did not exceed 600°C.

(2) If the surge had been reported as "moderate" or if any doubt exists on the crew report, carry out the checks listed in para. D.

H. Conclusion

(1) Vacate the engine air intake and twin secondary nozzle (Ref. 71-00-00, Servicing).

(2) Refit the access panels covering the spill door hinges. Torque load each fastener to between 25 and 30 lbf in (0.28 and 0.34 mdaN).

(3) Vacate the jet pipe and twin secondary nozzle, as necessary (Ref. 71-00-00, Servicing).

R 6. Inspection/Check for Recommissioning an Engine After Emergency Shut-down

NOTE: The following recommissioning check must be carried out before the engine is cleared for further flight.

If the engine has been windmilling with engine oil pressure
R indicated, refer to paras.6.A., B. and D. If the engine has been windmilling for up to 3 hours with complete loss of
R engine oil pressure refer to paras. 6.A., C. and D.

A. Prepare to Inspect.

(1) Carry out the procedure for entering the engine air intake, but do not position the engine intake cover on the engine face (Ref. 71-00-00, Servicing).

(2) Open the engine bay forward and rear door lower and side panels (Ref. 71-00-00, Servicing).

(3) Carry out the procedures for entering the twin secondary nozzle (Ref. 71-00-00, Servicing).

B. Inspect (After Engine Windmilling with Engine Oil Pressure Indicated).

(1) In the flight compartment:

(a) Check that the associated integrated drive generator NORM/DISC switch on panel 3-214 is at NORM.

(b) Check that the associated engine shut-down handle has been returned to its normal position (Ref. 26-22-00, Adjustment/Test).

(2) In the engine air intake:

(a) Visually examine the intake vanes and the LP compressor blades for cracks and damage at the compressor face and check for evidence of blade tip rubs. If damage is found, vacate the air intake and examine the LP compressor stage 7 and HP compressor stages 3 and 7 (Ref. 72-31-00 and 72-33-00, Inspection/Check). If further damage is found, carry out a complete inspection of the LP and HP compressors.

(b) Check the LP compressor for freedom of rotation.

(3) In the engine bay:

(a) Visually examine the zone for evidence of fire and torching flame, and deterioration of intumescent paint on the engine bay forward door and the secondary air doors.

(b) Check that the fire valve butterfly flap is reset so that it is in-line with the cooling duct. Also check that the flap is retained in the 'open' position by a latch engaging a lever on the outside of the fire valve.

NOTE: The fire valve is located in the low speed cooling air duct between the nacelle sidewall intake and the air conditioning primary heat exchanger.

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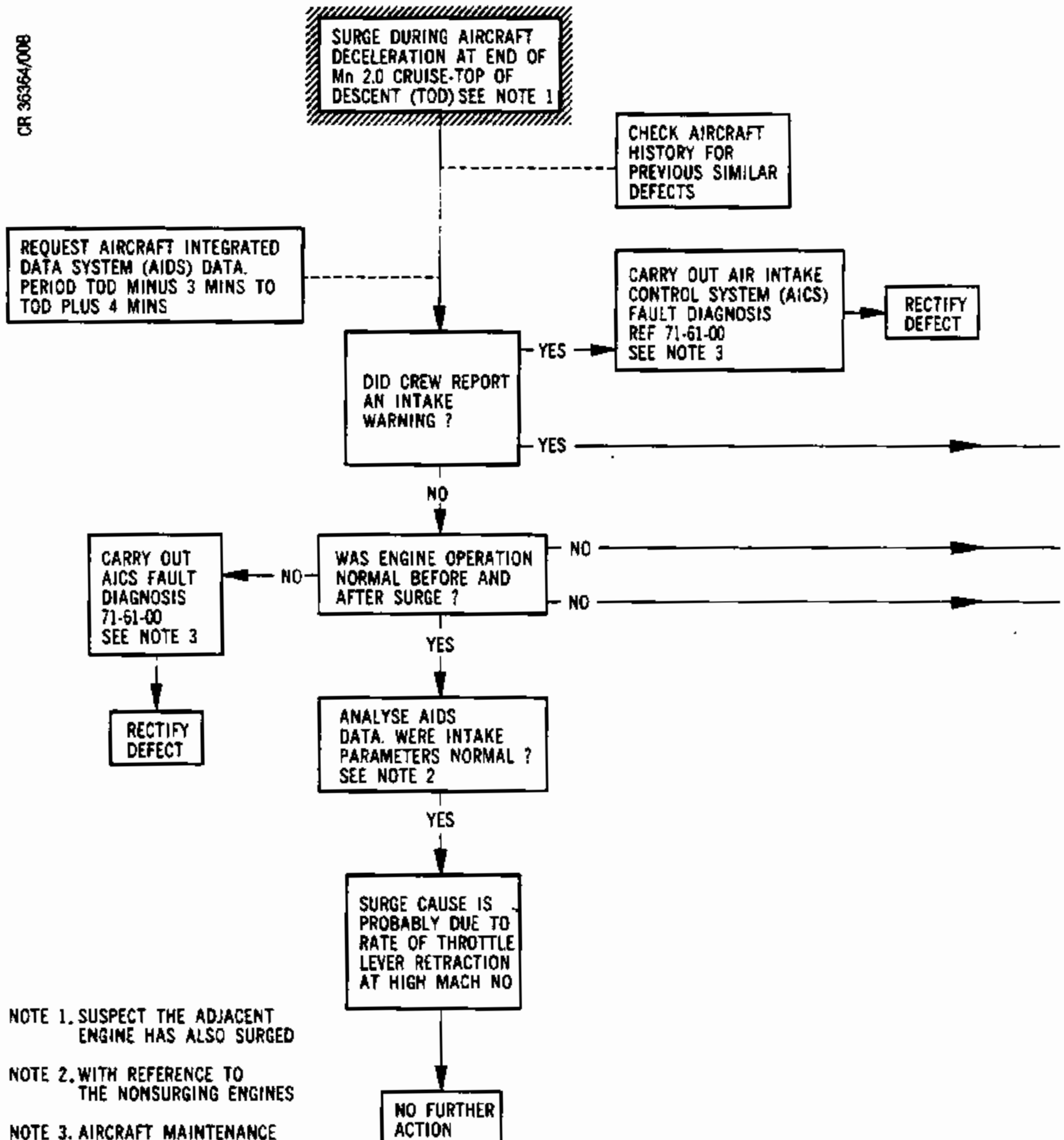

NOTE 1. SUSPECT THE ADJACENT ENGINE HAS ALSO SURGED

NOTE 2. WITH REFERENCE TO THE NONSURGING ENGINES

NOTE 3. AIRCRAFT MAINTENANCE MANUAL

Chart 602 (Sheet 1 of 2)

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CR 36365/008

GROUND EQUIPMENT

DESCRIPTION

GROUND POWER SUPPLY (115V a c)
CIRCUIT BREAKER SAFETY CLIPS
MULTI-TEST METER
CONTAINER FOR OIL DRAINAGE
(0-10 psi) GAUGE

R

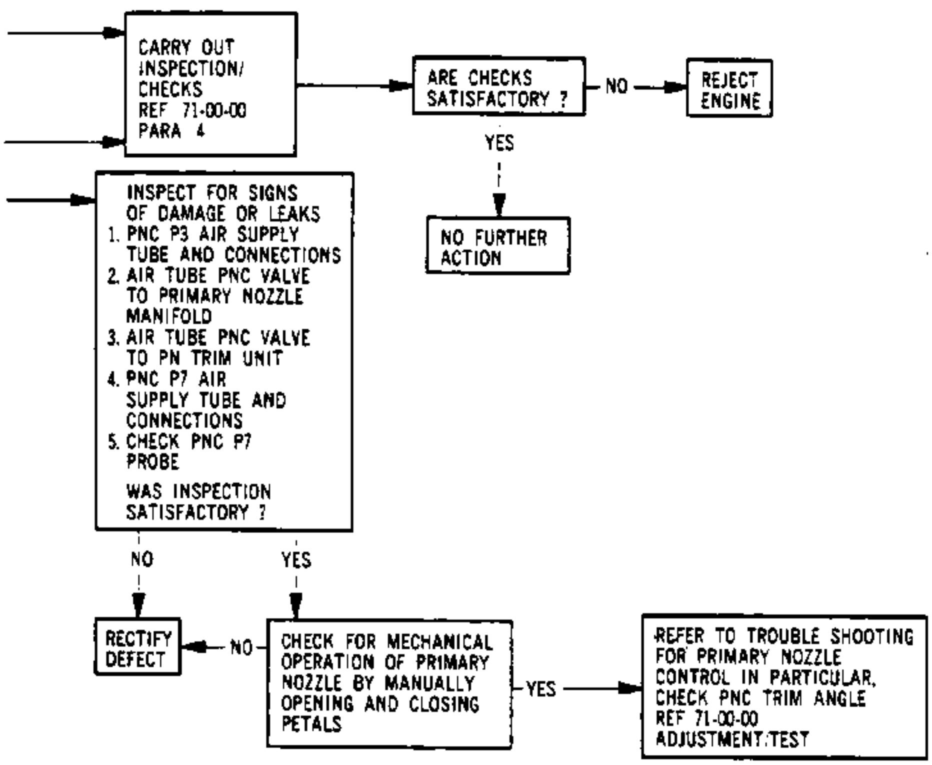


Chart 602 (Sheet 2 of 2)

(4) On the engine:

(a) If not already checked during fault investigation, inspect the right-hand gearbox magnetic plug and the master magnetic plug located in the oil container of the oil return tube (Ref.72-01-00, Servicing).

(b) If it is established that operation of the engine-driven hydraulic pump has operated with the associate shut off valve closed for a period exceeding 30 minutes, check that the main hydraulic pump or the main and the standby hydraulic pumps, as appropriate, have been changed and satisfactorily tested (Ref. 29-11-71, 29-12-71, 29-21-71, Removal/Installation).

NOTE: With the hydraulic shut-off valve closed there is no hydraulic fluid supply to lubricate and cool the pumps.

(c) Check that the oil level in the integrated drive generator (IDG) is within the oil level mark on the sight glass. If necessary replenish the IDG with the correct oil (Ref. 12-13-24).

(d) Check that the IDG disconnect mechanism has been reset by pulling the handle located on the under surface of the IDG and labelled RESET WITH ENGINE STATIC.

(e) Inspect the engine for evidence of oil and fuel leakage.

(f) Check the security of engine mounted pipes and accessories.

(g) Visually examine the engine for evidence of fire and torching flame, and deterioration of the electrical harness insulation.

(h) Check the engine oil tank contents. If the oil level is below 6.5 U.S. quarts as indicated on the tank dip stick, replenish the tank with the correct oil to the 6.5 U.S. quart mark (Ref. 12-13-79).

(5) Check that an operational test of the engine fire extinguisher system has been satisfactorily completed (Ref. 26-21-00, Adjustment/Test).

(6) Enter the twin secondary nozzle and jet pipe:

(a) At the turbine face, carry out a visual and tactile examination of the LP turbine nozzles and rotor blades for damage and for evidence of blade shroud rubs.

(b) If damage is found, inspect the HP turbine rotor blades (Ref. 72-51-00, Inspection/Check).

R (7) Leave the twin secondary nozzle and jet pipe (Ref. 71-00-00, Servicing).

(8) Ground-run the engine at 'idle' for 5 minutes, then shut-down the engine normally, (Ref. 71-00-00, Adjustment/Test).

(9) Allow the engine oil level to settle, then replenish the oil tank with the correct oil to normal level (Ref. 12-13-79).

(10) Inspect the right-hand gearbox magnetic plug and the master magnetic plug (Ref. 72-01-00, Servicing).

(11) Check all damage found against the limits of acceptance. Provided all limitations of acceptance are met, the engine can continue in service.

C. Inspect (After Engine Windmilling for up to 3 Hours with Complete Loss of Engine Oil Pressure).

R (1) Carry out the inspection procedure detailed in paras. 6.B. (1) to (7), but replenish the oil tank to normal level (Ref. 12-13-79).

(2) Ground run the engine at idle for 5 minutes (Ref. 71-00-00, Adjustment/Test) and then shut-down the engine normally.

(3) Inspect the pressure and scavenge filters and the right-hand gearbox magnetic plug and the master magnetic plug (Ref. 72-01-00, Servicing).

(4) Take an oil sample and carry out a spectrometric analysis (Ref. 79-00-03).

(5) If the inspection/check procedures in operations (3) and (4) meet the limits of acceptance and the inspection/check of
R paras. 6.B. (1) to (7) are satisfactory, then the engine may continue in service provided that the confirmatory check of operation (6) is subsequently satisfied.

(6) Take another oil sample and carry out a spectrometric analysis and inspect the magnetic plugs again within a further 10 ± 2 hours flying.

D. Conclusion

(1) Close the engine bay doors and vacate the engine air intake (Ref. 71-00-00, Servicing).

R 7. Inspection/Check for Recommissioning an Engine After a Precautionary Shut-down in Flight

NOTE: If an engine has been shut down in flight for any reason and it is subsequently shown that the engine may be serviceable, the following recommissioning check must be carried out before the engine is cleared for further flight.

R If the engine has been windmilling with engine oil pressure indicated, refer to paras. 6.A., B. and D. If the engine has been windmilling for up to 3 hours with complete loss of
R engine oil pressure, refer to paras. 6.A., C. and D.

A. Prepare to Inspect

(1) Carry out the procedures for entering the engine air intake and the twin secondary nozzle (Ref. 71-00-00, Servicing).

(2) Open the engine bay forward and rear door lower and side panels (Ref. 71-00-00, Servicing).

B. Inspect (After Engine Windmilling with Engine Oil Pressure Indicated).

(1) In the flight compartment, check that the associated integrated drive generator NORM/DISC switch on panel 3-214 is at NORM.

(2) In the engine air intake:

(a) Visually, examine the intake vanes and the LP compressor blades for cracks and damage at the compressor face and check for evidence of blade tip rubs. If damage is found, vacate the air intake and examine the LP compressor stage 7 and HP compressor stages 3 and 7 (Ref. 72-31-00 and 72-33-00, Inspection/Check). If further damage is found, carry out a complete inspection of the LP and HP compressors.

(b) Check the LP compressor for freedom of rotation.

(3) On the engine:

(a) If not already checked during fault investigation, inspect the right-hand gearbox magnetic plug and the master magnetic plug located in the oil container of the oil return tube (Ref. 72-01-00, Servicing).

(b) Check that the oil level in the integrated drive generator (IDG) is within the oil level mark on the sight glass. If necessary replenish the IDG with the correct oil (Ref. 12-13-24).

(c) Check that the IDG disconnect mechanism has been reset by pulling the handle located on the underside of the IDG and labelled RESET WITH ENGINE STATIC.

(d) Check the security of engine mounted pipes and accessories.

(e) Check the engine oil tank contents. If the oil level is below 6.5 U.S. quarts, as indicated on the dip stick, replenish the tank with the correct oil to the 6.5 U.S. quart mark (Ref. 12-13-79).

(4) Enter the twin secondary nozzle and jet pipe:

(a) At the turbine face, carry out a visual and tactile examination of the LP turbine nozzles and rotor blades for damage and for evidence of blade shroud rubs.

(b) If damage is found, inspect the HP turbine rotor blades (Ref. 72-51-00, Inspection/Check).

(5) Ground-run the engine at idle for 5 minutes (Ref. 71-00-00, Adjustment/Test) then shut-down the engine normally.

(6) Allow the engine oil level to settle, then replenish the oil tank with the correct oil to normal level (Ref. 12-13-79).

(7) Inspect the right-hand gearbox magnetic plug and the master magnetic plug (Ref. 72-01-00, Servicing).

(8) Check all damage found against the limits of acceptance. Provided all limitations of acceptance are met, the engine can continue in service.

C. Recommissioning Check after Windmilling for up to 3 Hours with Complete Loss of Oil Pressure.

R (1) Carry out the inspection procedures detailed in para. 6.B. (1) to (4) but replenish the oil tank to normal level (Ref. 12-13-79).

(2) Ground run the engine at idle for 5 minutes (Ref. 71-00-00, Adjustment/Test) and then shut-down the engine normally.

(3) Inspect the pressure and scavenge filters and the right-hand gearbox magnetic plug and the master magnetic plug (Ref. 72-01-00, Servicing).

(4) Take an oil sample and carry out a spectrometric analysis (Ref. 79-00-03).

(5) If the inspection/check procedures in operations (3) and (4) meet the limits of acceptance and the inspection/check referenced in operation (1) are satisfactory, then the engine may continue in service provided that the confirmatory check of operation (6) is subsequently satisfied.

(6) Take another oil sample and carry out a spectrometric analysis and inspect the magnetic plugs again within a further 10 ± 2 hours flying.

D. Conclusion

(1) Close the engine bay doors (Ref. 71-00-00, Servicing).

(2) Vacate the engine air intake and the twin secondary nozzle (Ref. 71-00-00,Servicing).

R 8. Action to be Taken Following Engine Overspeed

A. The action to be taken following a report of excessive N_1 or N_2 depends on the level and duration of the overspeed. Where the reported N_1 and/or N_2 is above the Maximum Operating Conditions but below the Overspeed Condition, having verified the engine speed instrumentation, an engine control system defect should be suspected (Refer to 76-11-00 Engine Power Controls - Adjustment/Test).

In the event of an incident of excessive N_1 or N_2 of any duration the position of the yellow pop-out button on the LPOG should be noted. This inspection should be performed before any other maintenance action is taken as the position of the button could be affected. This information should be reported to the Olympus 593 Project Office, Rolls-Royce, Filton, Bristol along with details of the incident.

If the N_1 permitted overspeed limitations have been exceeded, i.e. if 108.5%N_1 has been exceeded or if 102%N_1 has been exceeded for in excess of 20 seconds then the actions detailed in para. B must be taken.

If the N_2 limitations have been exceeded, i.e. if 110%N_2 has been exceeded or if Max. Contingency has been exceeded for in excess of 20 seconds or if any of the other operating speed limitations (as stated in the Engine Operating Instructions) have been exceeded, then the action detailed in para. C must be taken.

B. N_1 Overspeed.

Remove the engine (Ref. 71-00-12) and carry out the dis-assembly and inspection procedures detailed in the Olympus 593 Heavy Maintenance Manual,72-00-00, Appendix 3, Inspection/Check. The incident must be reported to the Olympus 593 Project Office, Rolls-Royce, Filton, Bristol for instruction on which components may be returned to service.

C. N_2 Overspeed.

Remove the engine (Ref. 71-00-12) and carry out the dis-assembly and inspection procedures detailed in the Olympus 593 Heavy Maintenance Manual, 72-00-00, Appendix 4, Inspection/Check. The incident must be reported to the Olympus 593 Project Office, Rolls-Royce, Filton, Bristol, for instruction on which components may be returned to service.

D. N_2 Overspeed in Reverse Thrust Configuration During Landing.

If the specified N_2 in reverse limitation has been exceeded during the use of the reverse thrust on landing, visually inspect the thrust reverser (Ref. 78-30-00, Inspection/Check).

R 9. Inspection/Check Following Engine Operation Under Supersonic Conditions with Anti-icing Valve Open

NOTE: Under these conditions, a carbon build-up can occur within the LP compressor front bearing chamber and associated oil scavenge tubes upstream of the LP compressor front bearing scavenge filter. These areas must be checked for freedom from carbon deposits on the next return to base or within ten hours flying time commencing from the start of a period of operation in this condition.

A. Equipment and Materials.

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Suitable container of 1 gal (4l) capacity approx.	-
Clean engine oil of the same specification/type as exists in the engine oil tank	-
Torque spanner, range 0-120 lbf in (0-1.35 mdaN)	-
High temperature resistant nimonic wire, 0.31 in (0.8 mm)dia.	DTD 747

B. Check the LP Compressor Front Bearing and Associated Scavenge Tubes Upstream of the Scavenge Filter.

(1) Open the engine bay front lower door (Ref. 71-00-00, Servicing).

(2) Paragraph Cancelled.

(3) Remove the air intake fairing (Ref. 72-21-01, Removal/Installation).

(4) Disconnect the engine vibration transducer cable connector from transducer:

(a) On engines to pre S.B.OL.593-77-8611-26 standard remove the locking clip, then unscrew the cable connector from the transducer.

(b) On engines to S.B.OL.593-77-8611-26 standard, unscrew the connector.

(c) Discard the sealing ring.

(5) Remove the bearing housing cover:

(a) Remove the 24 bolts securing the cover and note the position of transducer cable bracket for installation purposes.

(b) Screw the slave bolts (0.250 in 28 UNF) into the cover extraction holes and withdraw the cover, together with gasket, from the engine.

(c) Clean the exposed region of the bearing chamber ensuring that soft carbon deposits are removed from the following areas:

(a) Front face of bearing.

(b) Chamber walls and bearing housing cover.

(c) Inner end of the scavenge tube ensuring that it is unobstructed.

(7) Remove, clean and process the LP compressor front bearing scavenge filter as detailed in 72-01-00, Servicing and Inspection/Check.

(8) Carry out an oil flow check of scavenge tubes:

(a) Position a container under the filter location to catch oil drainage.

(b) With a second operator positioned at the filter location, to observe oil flow, pour clean engine oil into the bearing housing.

(c) For a satisfactory check, a free flow of oil through the scavenge tubes must be seen.

(d) On completion of a satisfactory check, carry out the installation procedure detailed in paragraph D.

(e) If a restricted oil flow is seen, carry out the additional check procedure detailed in paragraph C.

C. Additional Check Procedure

(1) Remove the oil scavenge tube (scavenge flange to tube connection) as detailed in 72-01-04, Removal/ Installation.

(2) Carry out an oil flow check of internal scavenge tube:

(a) Position a container under scavenge flange location to catch oil drainage.

(b) With a second operator positioned at the scavenge flange location, to observe oil flow, pour clean engine oil into the bearing housing.

(c) Assess the flow of oil from the scavenge tube and proceed as follows:

(c1) On completion of a satisfactory check, where a free flow of oil is obtained,

clean the oil scavenge tube (scavenge flange to tube connection) to remove any blockage and then carry out the installation procedures detailed in paragraph D.

(c2) If a restricted oil flow is seen, clean the removed oil tube, install removed items (Ref. para. D) and then remove the engine for module servicing/rectification.

D. Installation Procedure

(1) If previously removed, install the oil scavenge tube (scavenge flange to tube connection) as detailed in 72-01-04, Removal/Installation.

(2) Install the LP compressor front bearing scavenge filter as detailed in 72-01-00, Servicing.

(3) Install the bearing housing cover:

(a) Apply lubricant B (Ref.70-00-01, Servicing and Storage Materials) to attachment bolts.

(b) With a new gasket between mating faces and the assembly pin engaged, hold the bearing housing cover in position on the bearing housing.

(c) With the transducer cable bracket in the position noted during removal, retain the cover with 24 bolts lightly tightened locating the two longer bolts at the bracket position.

(d) Torque-tighten each bolt to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

(4) Connect the engine vibration transducer cable connector to the transducer:

(a) Position a new sealing ring against the shoulder of the connector end, then assemble the connector to the transducer receptacle.

(b) On engines to pre S.B.OL.593-77-8611-26 standard, torque-tighten the transducer connector nut to between 60 and 100 lbf in. (0.678 and 1.130 mdaN) until the castellations of the nut align with those of the adjacent nut. Engage the locking clip with the castellations and if the clip is to S.B.OL.593-71-11 standard, wire-lock the clip ends together.

(c) On engines to S.B.OL.593-77-8611-26 standard, torque-tighten the transducer connector nut to between 60 and 100 lbf in (0.678 and 1.130 mdaN). Wire-lock the connector nut.

(5) Install the air intake fairing (Ref. 72-21-01, Removal/Installation).

(6) With the oil tank full (Ref. 12-13-79) and the overflow drain connection drain plug installed, add a quantity of clean engine oil to the tank equivalent to that drained during removal procedure.

(7) Close the engine bay doors (Ref. 71-00-00, Servicing).

R 10. Inspection/Check After Hot Gas/Air Leak in Engine Bay or Prolonged Jet Pipe Fire

WARNING: COMPLY WITH THE ELECTRICAL SAFETY PRECAUTIONS IN 24-00-00.

NOTE: When overheating in the engine bay is indicated the integrity of the electrical wiring in the vicinity of the hot gas/air leak must be confirmed, including cables enclosed in conduit. To assist in identifying cable runs electrical equipment in the nacelle is listed in Table 601.
When multiple pin connectors are removed to facilitate wiring insulation tests, all affected circuits must be tested after assembly in accordance with the relevant maintenance practice.

After SB 71-076

Replace any damaged temperature sensitive wires on the firewire sidewall plate in accordance with 71-32-17.

A. Equipment and Materials

DESCRIPTION	PART NO.
Insulation resistance tester 500V	-

B. Prepare to Inspect

(1) Open the engine bay forward and rear door lower and side panels (Ref. 71-00-00, Servicing).

C. Inspect

(1) Visually inspect conduits and cable in the vicinity of the hot gas/air leak for signs of possible damage to cable insulation due to the application of excessive heat.

(2) Where damage is revealed or suspected identify the affected cable(s) (Ref. Table 601) and disconnect them from the equipment and from the nearest nacelle/wing plug - receptacle break point.

(3) Make a note of all electrical circuits that have been disconnected by the withdrawal of plug connectors.

(4) Using an insulation resistance tester, test the suspected cable(s), pin to pin and pin to earth.

PLUG BREAK/ EQUIP. DESCRIPTION	ENG BAY NO.	EQUIP. ELECT. IDENT.	WIRING DIAGRAM MANUAL REF.	MAINT. MANUAL REF.
U4000				
Flame detection sensor	ALL	W425	26-14-11,21,31,41	26-14-00
Integrated generator drive	ALL	X1	24-21-21,22,23,24	24-11-11
U4009				
Over pressure switch	ALL	H650	21-11-11,21,31,41	21-11-16
Over pressure switch	ALL	H651	21-11-11,21,31,41	21-11-16
Overheat sensor	ALL	H654	21-12-12,22,32,42	21-13-00
Pressure switch	ALL	H884	21-12-51,61,71,81	21-13-00
Primary temperature valve	ALL	H886	21-12-51,61,71,81	21-13-00
Air pressure transmitter	ALL	H892	21-11-11,21,31,41	21-11-17
Ground run flap actuator	ALL	K233	71-31-11,21,31,41	71-31-11
Detector element	1&3	W124	26-12-11	26-12-00
Detector element	2&4	W123	26-12-21	26-12-00
Element loop	ALL	W161	26-11-11,21,31,41	26-12-00
U5034				
Primary nozzle AJ transducer	ALL	E83	77-14-11	78-12-50
Air shut-off valve	1	H646	21-11-11	21-11-11
Cross-bleed valve	1	H879	21-14-11	21-14-11
P7 detector	1	K1563	76-15-11	76-15-00
U5035				
Air conditioning valve	1	H645	21-11-51	21-11-13
PN trim unit	1	K23A	76-13-11	76-13-11
Flame detection sensor	1	W419	26-14-11	26-14-00
U5038				
Ejector (Jet pump) valve	1	H882	21-13-11	21-13-12
PN trim unit	1	K23B	76-13-11	76-13-11
Reheat ignition transformer	1	K1560	76-15-81	74-12-11
Flame detection sensor	1	W417	26-14-11	26-14-00
U5054				
Mass flow control valve	1	H880	21-11-51	21-11-14
Detector element	1	W126	26-12-11	26-12-00
Detection loop	1	W162	26-11-11	26-11-00
Ejector (Jet pump) valve	1	H882	21-13-11	21-13-12
U5049				
Air conditioning valve	2	H645	21-11-61	21-11-13
PN trim unit	2	K23A	76-13-21	76-13-11
Flame detection sensor	2	W419	26-14-21	26-14-00
U5050				

PLUG BREAK/ EQUIP. DESCRIPTION	ENG BAY NO.	EQUIP. ELECT. IDENT.	WIRING DIAGRAM MANUAL REF.	MAINT. MANUAL REF.
Primary nozzle AJ transducer	2	E83	77-14-11	78-12-50
Air shut-off valve	2	H646	21-11-21	21-11-11
Cross-bleed valve	2	H879	21-14-11	21-14-11
P7 detector	2	K1563	76-15-21	76-15-00
U5053				
Ejector (Jet pump) valve	2	H882	21-13-21	21-13-12
PN trim unit	2	K23B	76-13-21	76-13-11
Reheat ignition transformer	2	K1560	76-15-82	74-12-11
Flame detection sensor	2	W417	26-14-21	26-14-00
U5055				
Mass flow control valve	2	H880	21-11-61	21-11-14
Detector element	2	W126	26-12-21	26-12-00
Ejector (Jet pump) valve	2	H882	21-13-21	21-13-12
Detection loop	2	W162	26-11-21	26-11-00
U6034				
Air conditioning valve	3	H645	21-11-71	21-11-13
PN trim unit	3	K23A	76-13-31	76-13-11
Flame detection sensor	3	W419	26-14-31	26-14-00
U6035				
Primary nozzle AJ transducer	3	E83	77-14-11	78-12-50
Air shut-off valve	3	H646	21-11-31	21-11-11
Cross-bleed valve	3	H879	21-14-11	21-14-11
P7 detector	3	K1563	76-15-31	76-15-00
U6308				
Ejector (Jet pump) valve	3	H882	21-13-31	21-13-12
PN trim unit	3	K23B	76-13-31	76-13-11
Reheat ignition transformer	3	K1560	76-15-83	74-12-11
Flame detection sensor	3	W417	26-14-31	26-14-00
U6054				
Mass flow control valve	3	H880	21-11-71	21-11-14
Detector element	3	W126	26-12-21	26-12-00
Detection loop	3	W162	26-11-31	26-11-00
Ejector (Jet pump) valve	3	H882	26-13-31	21-13-12
U6049				
Primary nozzle AJ transducer	4	E83	77-14-11	78-12-50
Air shut-off valve	4	H646	21-11-41	21-11-11
Cross-bleed valve	4	H879	21-14-11	21-14-11
P7 detector	4	K1563	76-15-41	76-15-00

PLUG BREAK/ EQUIP.DESCRIPTION	ENG BAY NO.	EQUIP. ELECT. IDENT	WIRING DIAGRAM MANUAL REF.	MAINT. MANUAL REF.
U6050				
Air conditioning valve	4	H645	21-11-81	21-11-13
PN trim unit	4	K23A	76-13-41	76-13-11
Flame detector sensor	4	W419	26-14-41	26-14-00
U6053				
Ejector (Jet pump) valve	4	H882	21-13-41	21-13-12
PN trim unit	4	K23B	76-13-41	76-13-11
Reheat ignition transformer	4	K1560	76-15-84	74-12-11
U6055				
Mass flow control valve	4	H880	21-11-81	21-11-14
Detector element	4	W126	26-12-11	26-12-00
Detection loop	4	W162	26-11-41	26-11-00
Ejector (Jet pump) valve	4	H882	26-13-41	26-13-12

NOTE: Location of plug break points are given in the appropriate Wiring Diagram.

Plug/Receptacle Break Points for Inspection of
Electrical Cables in Nacelles
Table 601

D. Conclusion

(1) Repair or replace damaged cables as required.

(2) Carry out a functional or operational test as appropriate for all electrical circuits disconnected during the inspection procedures.

(3) Close the engine bay doors (Ref. 71-00-00, Servicing).

R 11. Inspection/Check of Engine Dressing Components After Engine Removal

NOTE: A preliminary list of engine dressing components is given in the following Table 602, together with material specification and references to permissible damage (P.D. Tables), with additional Notes and test pressures. Part numbers of engine dressing components are also given to assist in component identification/location should the situation demand use of the Power Plant Build-up Manual.

A. Inspect

(1) Visually inspect the listed brackets, pipes and fittings, (Ref. Table 602) for scores, abrasions, corrosion, damaged edges and corners, dents, cracks and wear.

(2) Compare damage with the appropriate permissible damage detailed in Tables 603, 604, 605 and 606.

(3) Where damage is found in excess of that allowed in the permissible damage tables, refer to Notes 1, 2, 3, 4, 5, 6 and 7 (Ref. Table 602) for action.

FIG.	ITEM	PART NO.	DESCRIPTION	DIA in/mm	t swg/mm	MATE-RIAL SPEC.	P.D. TABLE	NOTE	PSI X 100
STRUCTURAL COMPONENTS									
601	1	E765731101	Bracket		2.5	CM210	603	1	-
	2	E765412000	Mounting Platform		2.5	BACM63	604	1	-
	3	E531184003	Bracket		18 1.2	BSTA21	603	5	-
	4	E531185001	Bracket		18 1.2	BSTA21	603	5	-
	5	E766417000	Bracket		16 1.6	CM210	603	5	-
	7	E766416101	Bracket		various	CM213	604	1	-
	7	E745508100	Bracket		14 2.0	CM210	604	1	-
	8	E766432100	Bracket		2.5	BACM71	604	1	-
	9	E766445000	Bracket		various	S527	605	6	-
	10	E595092100	Bracket		various	BACM79	604	1	-
	11	E521452100	Bracket		18 1.2	S521	605	1	-
	12	E766429000	Bracket		various	BACM71	604	1	-
	13	E521678100	Deflector Plate		2.6	DTD5047	605	1	-
	14	E521625102	Bracket		various	BACM71	604	1	-
	15	E765668100	Bracket		14 2.0	CM230	603	1	-
	16	E765730003	Bracket		14 2.0	CM210	603	1	-
	17	E765412104	Mounting Platform		2.5	BACM63	605	1	
	18	E766407100	Bracket		2.5	BACM63	604	1	
	19	E766759100	Bracket		3.0	BACM71	604	1	
	20	E765754000	Clamp		various	BACM71	604	1	
	21	E766430101	Bracket		2.5	BACM71	604	1	
	22	E765756100	Bracket		3.0	BACM71	604	1	-
	23	E765757000	Clamp		Various	BACM71	604	1	-

Table 602 (continued)

	FIG. ITEM	PART NO.	DESCRIPTION	DIA in/mm	t swg/mm	MATE-RIAL SPEC.	P.D. TABLE	NOTE	PSI X 100
	24	E531184002	Bracket		18 1.2	BSTA21	603	5	-
	25	E531185000	Bracket		18 1.2	BSTA21	603	5	-
	26	E521243000	Bracket		14 2.0	S521	605	6	-
	27	E521453101	Bracket		14 2.0	DTD5047	605	1	-
	28	E745506000	Bracket		3.0	CM232	603	1	-
	29	E521625100	Bracket		various	BACM71	604	1	-
	30	E765669001	Bracket		1.6	CM230	603	6	-
R	31	E521563100	Lug Fitting			S130		6	-
R	32	E521344102	Elbow - Stud			AMS		6	-
R						5658G			
	NOZZLE SUPPLY PIPES								
	602 1	E521349002	Pipe Assy	1.5 38.1	20 0.9	T55	606	1	4.7
	2	E521348002	Pipe Assy	1.2 31.7	20 0.9	T55	606	3	4.7
R	3	E521348105	Pipe	1.5 38.1	20 0.9	T55	606	7	4.7
R	4	E521349003	Pipe Assy	1.5 38.1	20 0.9	T55	606	1	4.7
R	5	E521348003	Pipe Assy	1.2 31.7	20 0.9	T55	606	3	4.7
R	6	E521348106	Pipe	1.5 38.1	20 0.9	T55	606	7	4.7
	FUEL RECIRCULATION								
R	602 7	E744511002	Pipe	3/8 9.52	22 0.7	CM231	606	3	5.5
R	8	E745510004	Pipe	3/8 9.52	22 0.7	T55	606	2	10
	AIR CONDITIONING								
R	602 9	E521617000	Yoke		various	BACM71	604	1	-
R	10	E521533000	Mounting Spring		various		604	1	-
R	11	E521554000	Plate Keep		2.5	BSTA21	603	5	-
R	12	E521368000	Housing		various	BACM71	604	1	1.9
	SIGNAL SYSTEMS								
R	602 13	E521015015	Pipe		20 0.9	T55	606	2	4.7
R	14	E521015012	Pipe		20 0.9	T55	606	2	4.7
R	15	E521015013	Pipe		20 0.9	T55	606	2	4.7
R	16	E521015002	Pipe		20 0.9	T55	606	2	4.7
R	17	E521015034	Pipe		20 0.9	T55	606	2	4.7
R	18	E521015033	Pipe		20 0.9	T55	606	2	4.7
R	19	E521015014	Pipe		20 0.9	T55	606	2	4.7
R	20	E521015032	Pipe		20 0.9	T55	606	2	4.7

Table 602 (continued)

	FIG. ITEM		PART NO.	DESCRIPTION	DIA in/mm	t swg/mm	MATE-RIAL SPEC.	P.D. TABLE	NOTE	PSI X 100
	THERMOCOUPLE SUPPORT RAIL									
R	602	21	G605838004	Support Rail	1/4 6.35	22 0.7	CM231	606	3	-
R		22	G605838002	Support Rail	1/4 6.35	22 0.7	CM231	606	3	-
R		23	G605838003	Support Rail	1/4 6.35	22 0.7	CM231	606	3	-
R		24	G605839003	Support Rail	1/4 6.35	22 0.7	CM231	606	3	-
R		25	G605839002	Support Rail	1/4 6.35	22 0.7	CM231	606	3	-
R		26	G605964000	Support Rail	1/4 6.35	26 0.4	T55	606	3	-
	FUEL HEATING									
R	602	27	D524904001	Housing		various	BACM71	604	1	-
R		28	D766452001	Bracket		various	BACM71	604	4	-
R	HYDRAULIC PIPES									
R	602	29	E766436007	Pipe Assy	1/2 12.7	26 0.4	CM076	606	2	10
R		30	E766436026	Pipe Assy	1/2 12.7	26 0.4	CM076	606	2	10
R		31	E766436009	Pipe Assy	1/2 12.7	26 0.4	CM076	606	2	10
R		32	E766436028	Pipe Assy	1/2 12.7	26 0.4	CM076	606	2	10
R		33	E766778001	Pipe Assy	3/4 19.0	17 1.4	CM084	606	2	80
R		34	E766778002	Pipe Assy	3/4 19.0	17 1.4	BACM175	606	1	70
R		35	E766778003	Pipe Assy	3/4 19.0	17 1.4	BACM175	606	1	70
R		36	E766456032	Pipe	3/8 9.52	26 0.4	CM076	606	2	10
R		37	E766456040	Pipe	3/8 9.52	26 0.4	CM076	606	2	10
R		38	E766456052	Pipe	5/8 15.87	18 1.2	CM084	606	2	22
R		39	E766456037	Pipe Assy	3/4 19.0	17 1.4	CM084	606	2	80
R		40	E766456050	Pipe Assy	3/4 19.0	17 1.4	BACM175	606	1	70
R		41	E766456051	Pipe Assy	3/4 19.0	17 1.4	BACM175	606	1	70
R		42	E766456045	Pipe Assy	3/4 19.0	17 1.4	CM084	606	2	80
R		43	E766456035	Pipe Assy	5/8 15.87	18 1.2	CM084	606	2	80
R		44	E766456043	Pipe Assy	5/8 15.87	18 1.2	CM084	606	2	80
R		45	E766722000	Pipe	1/2 12.7	26 0.4	CM076	606	1	10
R		46	E766702002	Connector		various	CM213	604	1	54
R		47	E766456036	Pipe	5/8 15.87	18 1.2	CM084	606	2	80
R		48	E766456044	Pipe	5/8 15.87	18 1.2	CM084	606	2	80
R		49	E766436021	Pipe	3/8 9.52	26 0.4	CM076	606	2	10
R		50	E766436046	Pipe	3/8 9.52	26 0.4	CM076	606	2	10
R		51	E766436020	Pipe	3/8 9.52	26 0.4	CM076	606	2	10
R		52	E766436045	Pipe	3/8 9.52	26 0.4	CM076	606	2	10
R		53	E766436012	Pipe	1/2 12.7	26 0.4	CM076	606	2	10
R		54	E766436037	Pipe	1/2 12.7	26 0.4	CM076	606	2	10

Table 602 (continued)

	FIG. ITEM	PART NO.	DESCRIPTION	DIA in/mm	t swg/mm	MATE-RIAL SPEC.	P.D. TABLE	NOTE	PSI X 100
	HYDRAULIC TANK PRESSURIZATION PIPES								
R	602 55	E521165000	Pipe	1/2 12.7	22 0.7	T55	606	1	2.8
R	56	E521167004	Pipe	1/2 12.7	22 0.7	T55	606	2	2.8
R	57	E521166001	Pipe	1/2 12.7	22 0.7	T55	606	2	2.8
	IDG DRAINS								
R	602 58	E521150000	Pipe	1/2 12.7	22 0.7	T55	606	2	1.3
R	59	E521285004	Pipe	5/16 7.94	18 1.2	CM231	606	2	1.3
R	60	E521150001	Pipe	5/16 7.94	22 0.7	T55	606	2	1.1
R	JET PIPE DRAIN								
R	602 61	E745502000	Drain Block	3/8 9.52	22 0.7	T55	606	2	1.1
R	62	E744552000	Union Ext		various	S130	606	1	-
R	63	E745514000	Pipe Assy	3/8 9.52	22 0.7	T55	606	1	1.1
	FIRE EXTINGUISHER SYSTEM								
R	602 64	E531183000	Nozzle Assy	1/2 12.7	22 0.7	T55	606	1	5
R	65	E531181000	Pipe	5/8 15.9	22 0.7	T55	606	2	10
R	66	E531182003	Pipe	5/8 15.9	22 0.7	T55	606	2	10
R	67	E531182002	Pipe	5/8 15.9	22 0.7	T55	606	2	10
R	68	E531180001	Pipe	3/4 19.0	22 0.7	T55	606	3	10

NOTES:

1. Change component.
2. Change component, or repair by part replacement or insert using PERMASWAGE joint technique (Ref. 20-23-23). Materials and geometry to be in accordance with design standards. For repairs off the aircraft, pressure test to the value indicated in Table 602, column 9, (Ref. 20-23-15). For repairs in situ, pressure test for leaks to system working pressure.
3. Change component, or repair by welding. Welded pipes and welded brackets may be rewelded. Flanges may be replaced and welded to pipes by automatic orbital torch T.I.G. welding techniques (Ref. 20-26-43) or argon arc (Ref. 20-26-38). No stress relieving or heat treatment is required after welding. Pressure test the repaired pipes to the value indicated in Table 602, column 9 (Ref. 20-23-14).

Table 602 (continued)

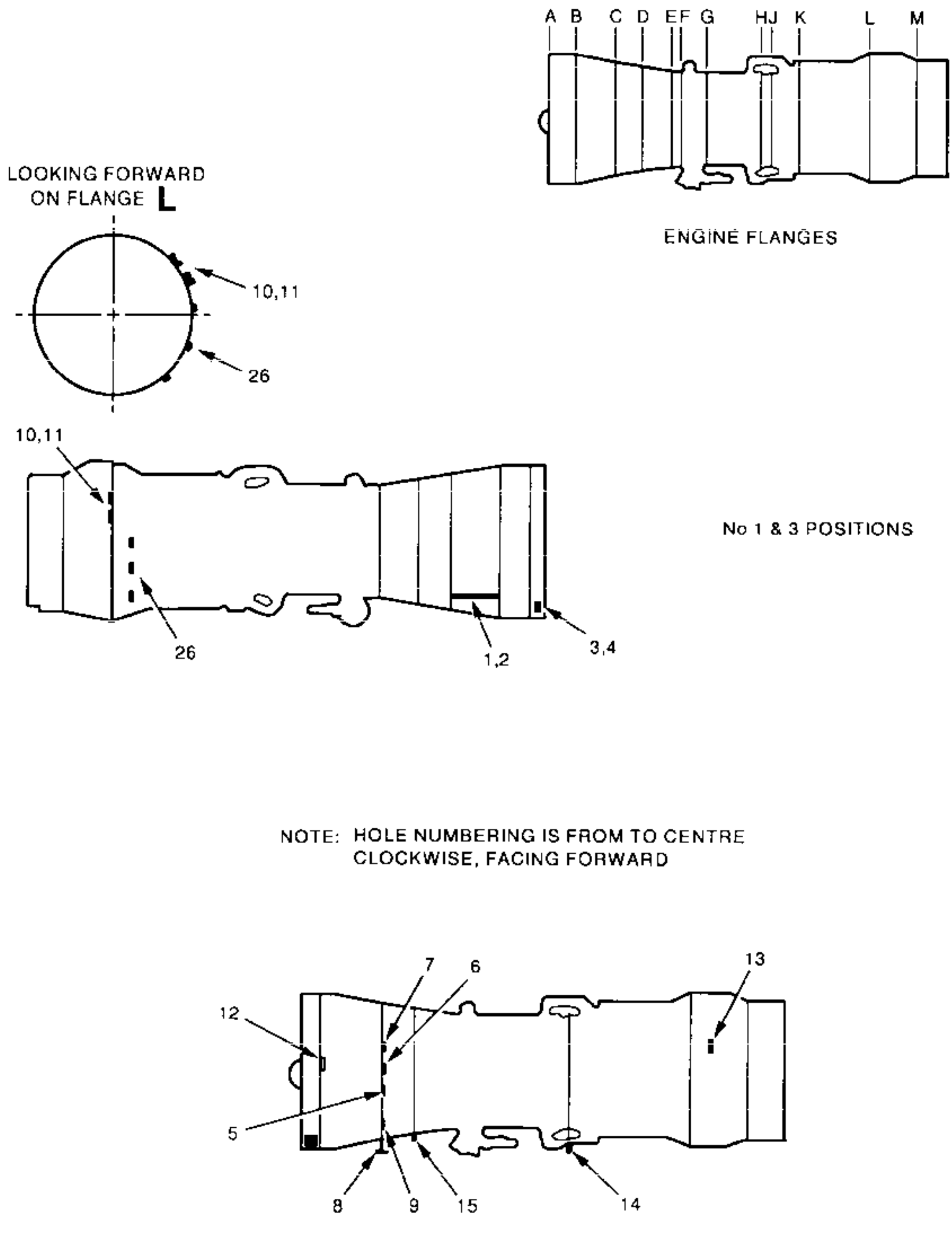
4. Change component, or rectify cracks by welding (Ref. 20-26-41). Damaged flanges and enlarged holes may be rectified by part replacement to design standard and welded in position.

5. Change component, or repair enlarged holes and cracks in the component by welding (Ref. 20-26-41). No stress relieving or heat treatment is required after welding.

6. Change component, or repair cracks by welding (Ref. 20-26-42). Rectify damaged flanges by part replacement to design standard and weld in position. No heat treatment after welding is required.

R 7. Change component, or repair by removing a two inch
R length of pipe containing the damage (Ref. Repair
R Instruction 52-1007) and insert a suitable length of
R NSA 3512 (20 SWG 1½ in OD) material in its place.
R Argon Arc weld the butt joints. Pressure test the
R repaired pipes to the value indicated in Table 602,
R column 9 (Ref. 20-23-14).

Engine Dressing Components
Table 602 (concluded)



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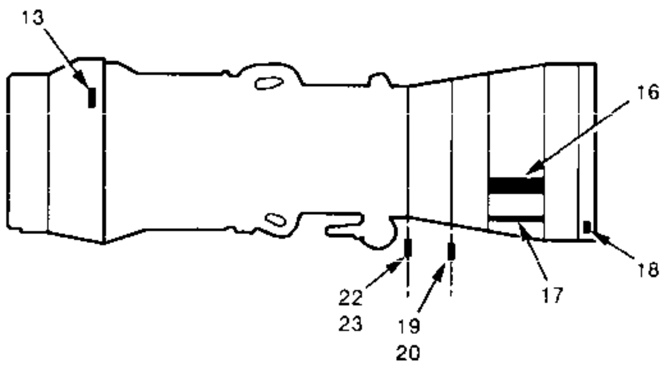
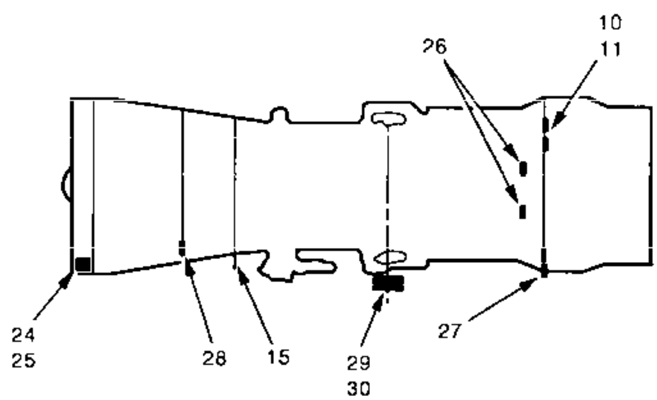
CMB 71 00 00 6 BAMA 01

Bracket Installation (Sheet 1 of 2)
Figure 601

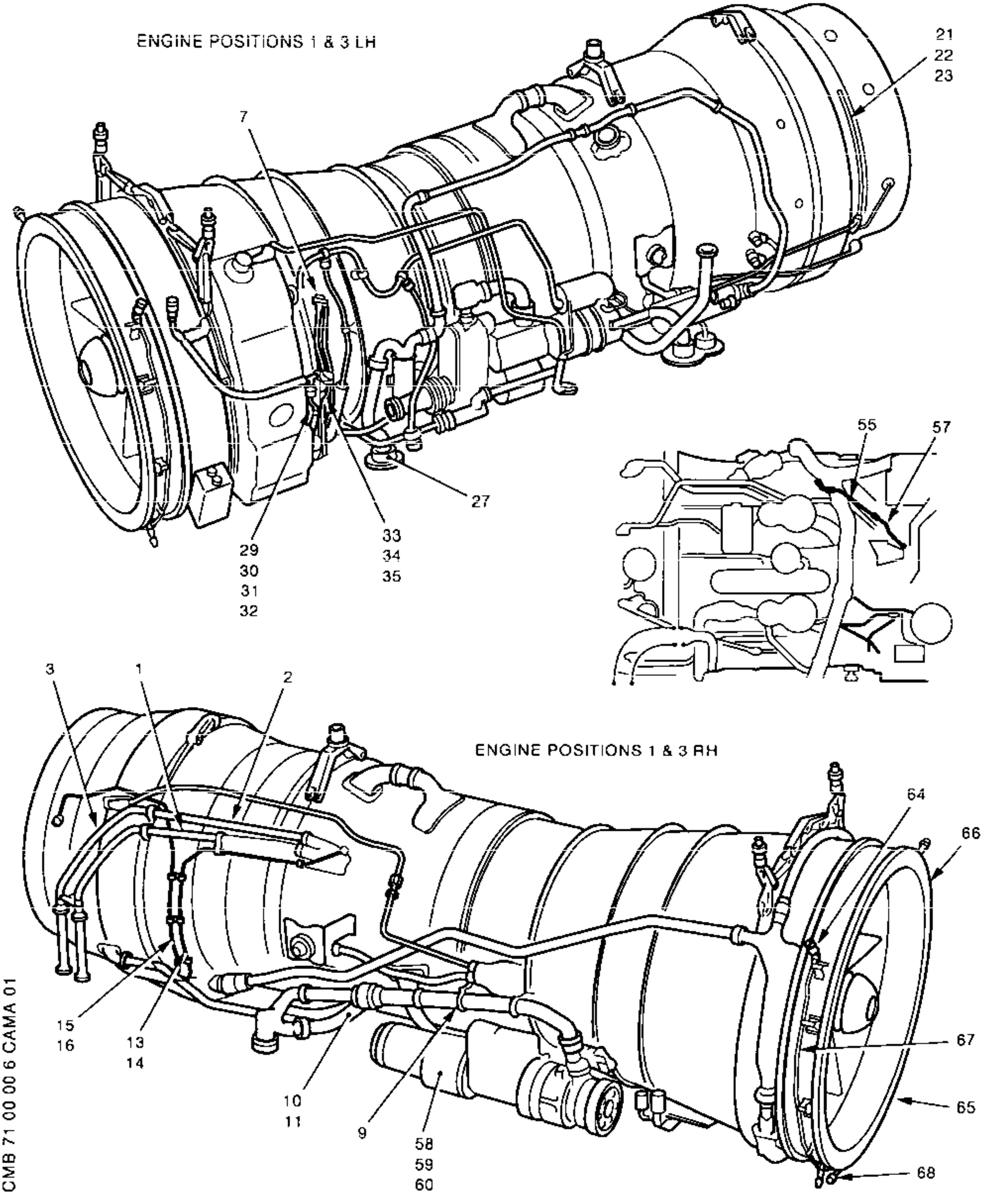




No 2 & 4 POSITIONS

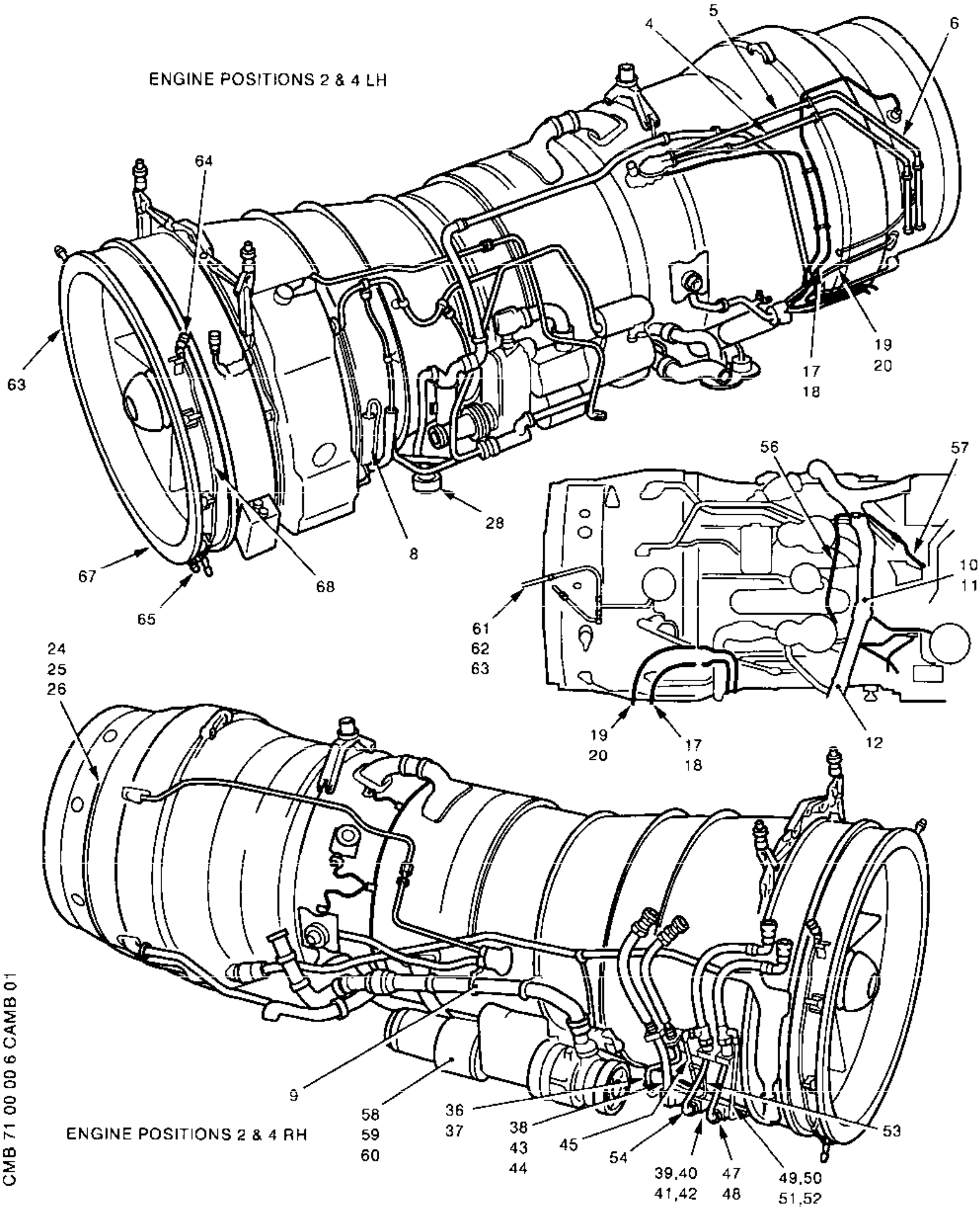
CMB 71 00 00 6 BAMB 00

Bracket Installation (sheet 2 of 2)
Figure 601



R

Pipes and Fittings (Sheet 1 of 2)
Figure 602



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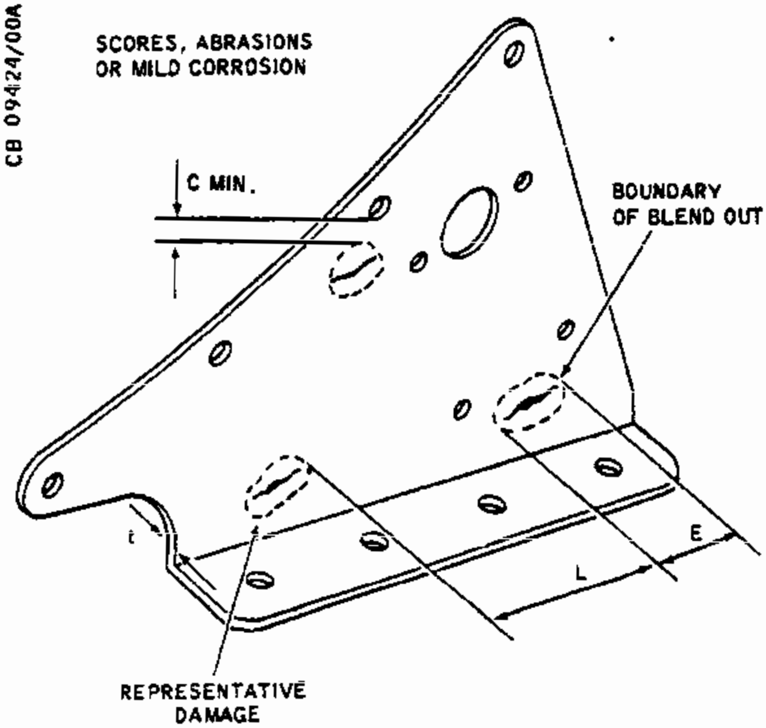
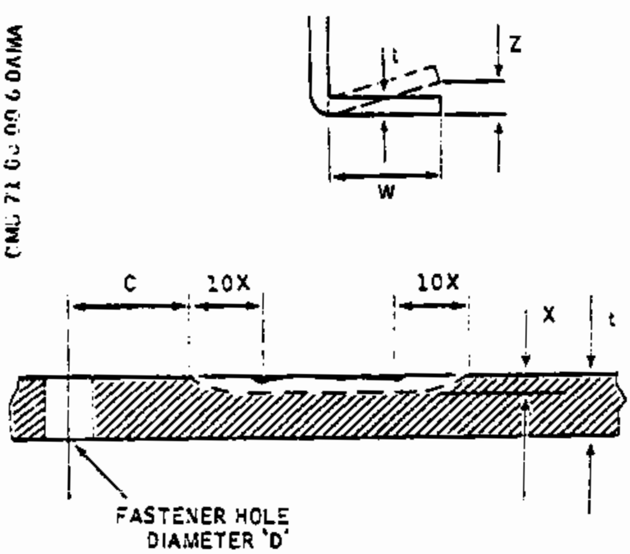
Pipes and Fittings (Sheet 2 of 2)
Figure 602

DAMAGE TYPE AND DESCRIPTION	LIMITATIONS

CB 09424/00A



CMD 71 00 00 6 DAMA



X = DEPTH OF BLENDED OUT AREA $\frac{T}{10}$ OR 0.01 in (0.25 mm) MAX, WHICHEVER IS SMALLER

L = DISTANCE APART TO BLEND OUT AREA 2.0 in (50.80 mm) MIN.

E = DIMENSION OF BLENDED AREA 3.0 in (76.20 mm) MAX.

C = MIN. EDGE CLEARANCE

t = LOCAL THICKNESS

AFTER BLENDING OUT, AREA MUST BE CRACK DETECTED

AFFECTED AREA MUST BE CHECKED TO ENSURE THAT ALL TRACES OF CORROSION ARE REMOVED AND AREA REPROTECTED AS REQUIRED

$Z = \frac{W}{20}$ MAX.

FREE FLANGE DEFORMATION IS PERMITTED IF IT IS SMOOTH WITHOUT KINKING RADIUS = 5t MIN.

W = FLANGE WIDTH

NOTE:

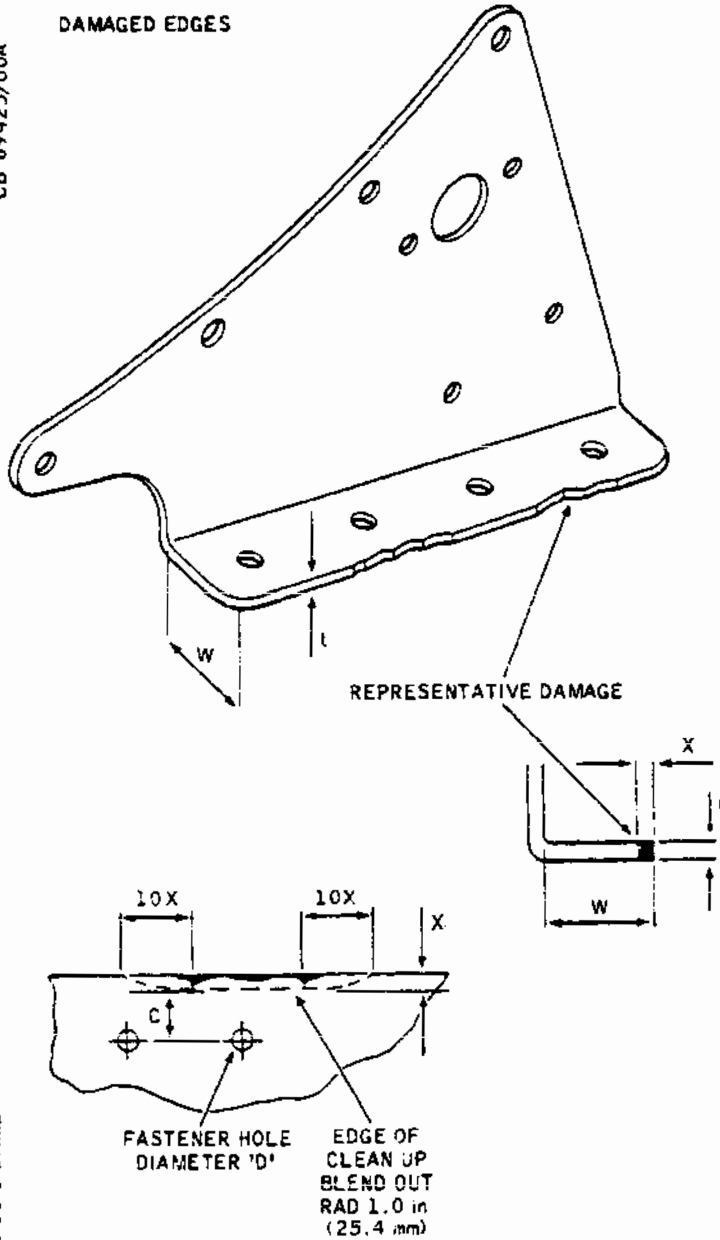
LOCAL SUPPORT STRUCTURE AND ATTACHMENTS ARE TO BE CHECKED FOR DAMAGE

GRINDING OF TITANIUM IS NOT ALLOWED

R

Permissible Damage - Rolled Brackets
Table 603 (Sheet 1 of 3)

DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
DAMAGED EDGES	X = DEPTH OF BLENDED AREA $\frac{W}{4}$ OR 0.05 in (1.27mm) MAX. WHICHEVER IS SMALLER C = MIN. EDGE DISTANCE: PLAIN HOLES = 1.8D COUNTERSUNK HOLES: RIVETS = 2.2D BOLTS = 2.0D REMOVE RIVETS AS REQUIRED TO GAIN ACCESS, THEN RE-RIVET DAMAGE TO BE BLENDED OUT AS SHOWN. AREA MUST BE CRACK DETECTED AND RE-PROTECTED AS REQUIRED W = FLANGE WIDTH NOTE: GRINDING OF TITANIUM IS NOT ALLOWED t = LOCAL THICKNESS



CB 09425/00A

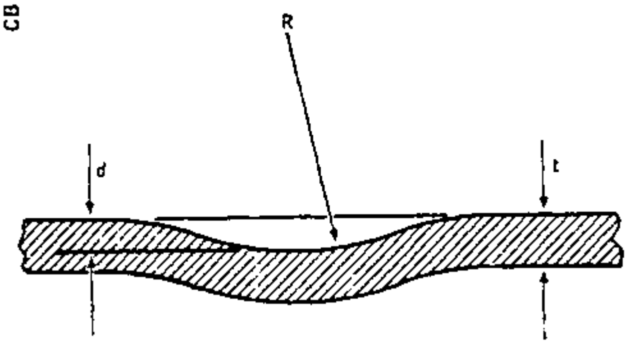
CMB 71 00 00 6 DAMB

Permissible Damage - Rolled Brackets
Table 603 (Sheet 2 of 3)

R

DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
SMOOTH DENTS (FOR t = 0.064 in (1.65 mm) MAX.)	DENTS ARE NOT PERMITTED IN FLANGES AND ARE NOT TO RUN INTO BEND RADIUS $d = \frac{t}{2}$ OR 0.03 in (0.76 mm) MAX. WHICHEVER IS SMALLER R = 5t MIN. CHECK AFFECTED FASTENERS IN VICINITY OF DENT FOR SECURITY AND RETIGHTEN OR RE-RIVET WHERE NECESSARY AND SEAL IS REQUIRED DEPTH OF ASSOCIATED SCORES MUST NOT EXCEED $\frac{t}{20}$ BLEND OUT SCORES, CRACKS DETECT AREA AND REPROTECT AS REQUIRED
CRACKS	NOT PERMITTED SMALL EDGE CRACKS ARE TO BE TREATED AS DETAILED IN DAMAGED EDGED

CB 09476/00A

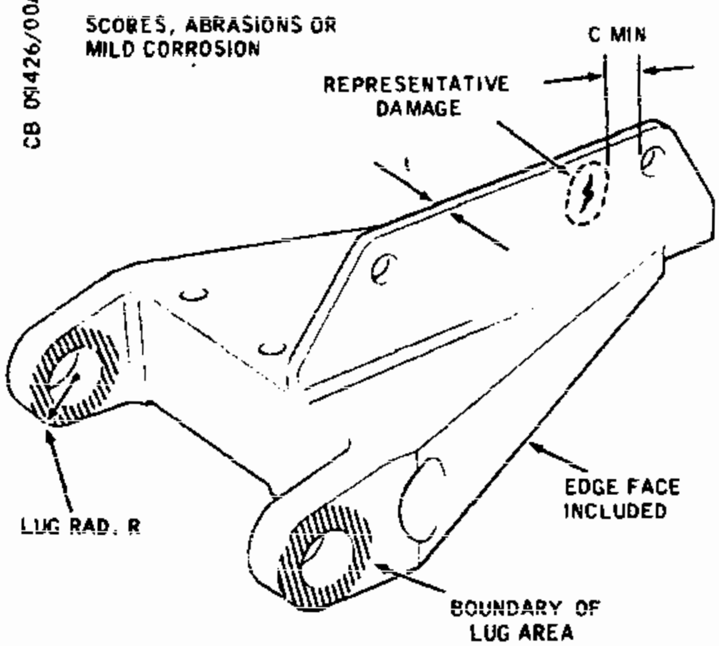


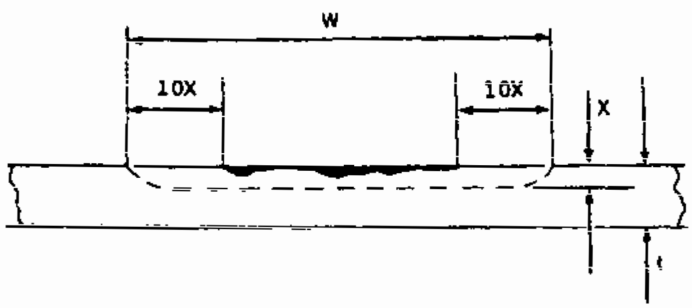
CMB 71 00 00 6 DAMC

R Permissible Damage - Rolled Brackets
Table 603 (Sheet 3 of 3)

DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
SCORES, ABRASIONS OR MILD CORROSION	X = DEPTH OF BLENDED OUT AREA $\frac{t}{10}$ OR 0.015 in (0.38 mm) MAX WHICHEVER IS SMALLER X IS CALCULATED USING LOCAL VALUE OF t

CB 051426/00A





IN LUG AREAS AND ACROSS FASTENER HOLE :

X = $\frac{t}{20}$ OR 0.01 in (0.25 mm) MAX; WHICHEVER IS SMALLER

L = DISTANCE APART TO BLEND OUT BOUNDARY 0.50 in (12.70 mm) MIN.

W = DIMENSION OF BLENDED AREA 0.50 in (12.70 mm) MAX.

C = MIN. EDGE CLEARANCE (DIA.D)

D = FASTENER HOLE DIA.

t = LOCAL THICKNESS

AFTER BLENDING OUT, AREA MUST BE CRACK DETECTED.

AFFECTED AREA MUST BE CHECKED TO ENSURE THAT ALL TRACES OF CORROSION ARE REMOVED AND AREA RE-PROTECTED AS REQUIRED

NOTE:

GRINDING OF TITANIUM IS NOT ALLOWED

CMB 71 00 00 6 EAMA

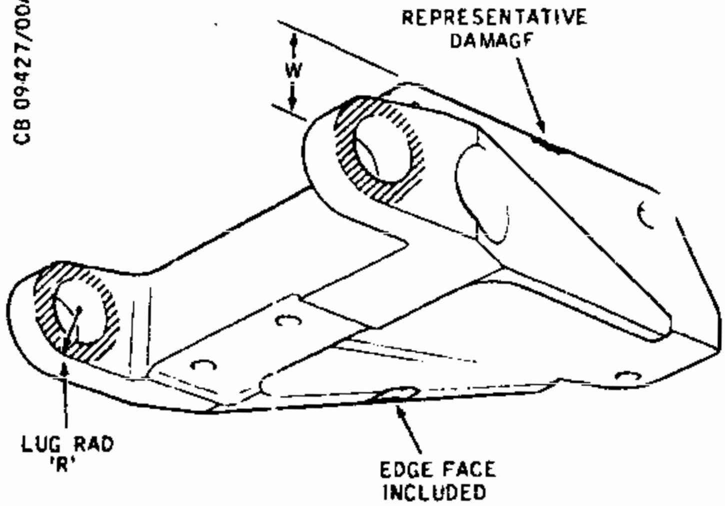
R

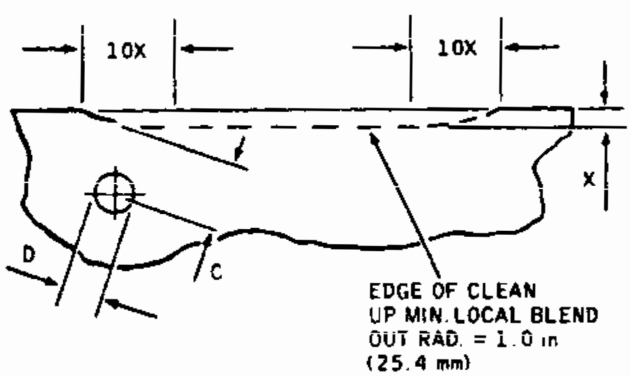
Permissible Damage - Fittings, Brackets, Cleats - Table 604 (Sheet 1 of 3)

DAMAGE TYPE AND DESCRIPTION	LIMITATIONS

DAMAGED EDGES

CB 09427/00A





CMB 71 00 00 6 EAMB

X = DEPTH OF BLENDED OUT AREA
$\frac{W}{10}$ OR 0.05 in (1.27 mm) MAX.
WHICHEVER IS SMALLER

W = LOCAL (OR EFFECTING) DEPTH
OF WEB

NOTE:
FOR TAPERED WEBS TAKE 'W'
AS MEAN DEPTH OF WEB

D = FASTENER HOLE DIA.

C = MIN. EDGE CLEARANCE
PLAIN HOLES = 1.8D
COUNTERSUNK HOLES:
RIVETS = 2.2D
BOLTS = 2.0D

PERMISSIBLE DAMAGE IN LUG AREAS:

X = $\frac{W}{20}$ OR 0.01 in (0.25 mm)
MAX. WHICHEVER IS SMALLER

DAMAGED AREA TO BE BLENDED OUT
AS SHOWN, CRACK DETECTED AND
REPROTECTED

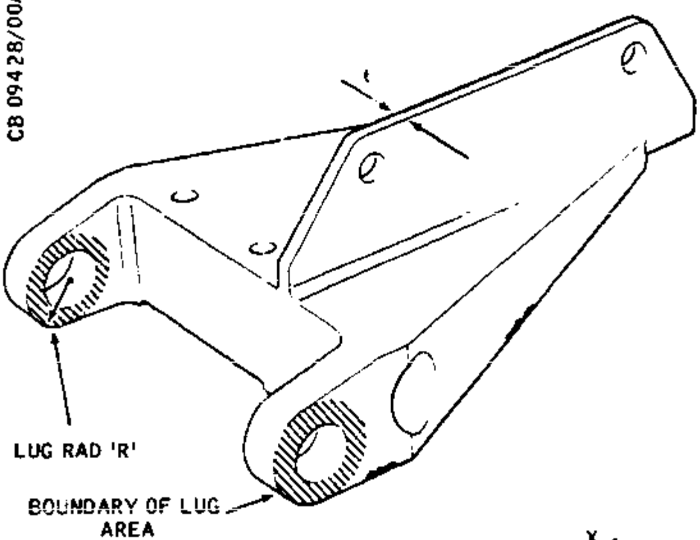
NOTE:
GRINDING OF TITANIUM ALLOY
IS NOT ALLOWED

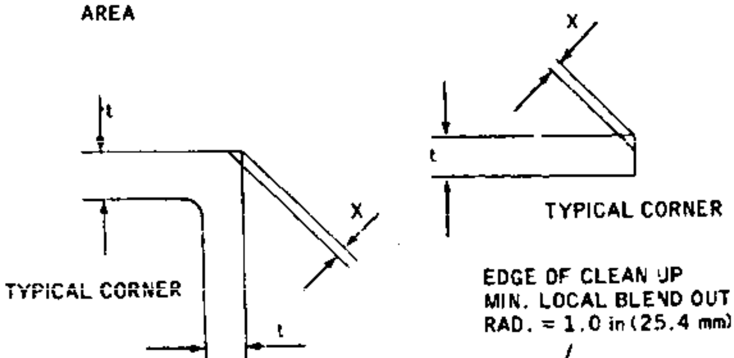
R

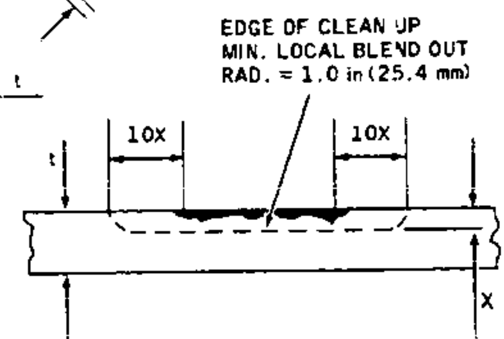
Permissible Damage - Fittings, Brackets,
Cleats - Table 604 (Sheet 2 of 3)

DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
DAMAGED CORNERS	X = DEPTH OF BLENDED OUT AREA $\frac{t}{4}$ OR 0.05 in (1.27 mm) MAX WHICHEVER IS SMALLER t = FLANGE OR WEB THICKNESS X IS CALCULATED USING LOWER VALUE OF t IN LUG AREAS: X = $\frac{t}{8}$ OR 0.03 in (0.76 mm) MAX. WHICHEVER IS SMALLER DAMAGED AREA TO BE BLENDED OUT AS SHOWN, CRACK DETECTED AND REPROTECTED NOTE: SECTION THICKNESS AFTER BLEND OUT IS TO BE NOT LESS THAN 0.9t AT HEEL POINT, WHERE t IS THE THICKNESS OF THE THINNER FLANGE GRINDING OF TITANIUM IS NOT ALLOWED

CB 09428/00A





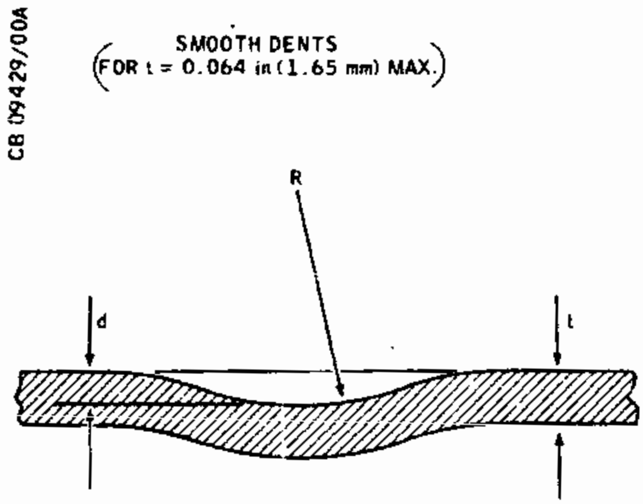
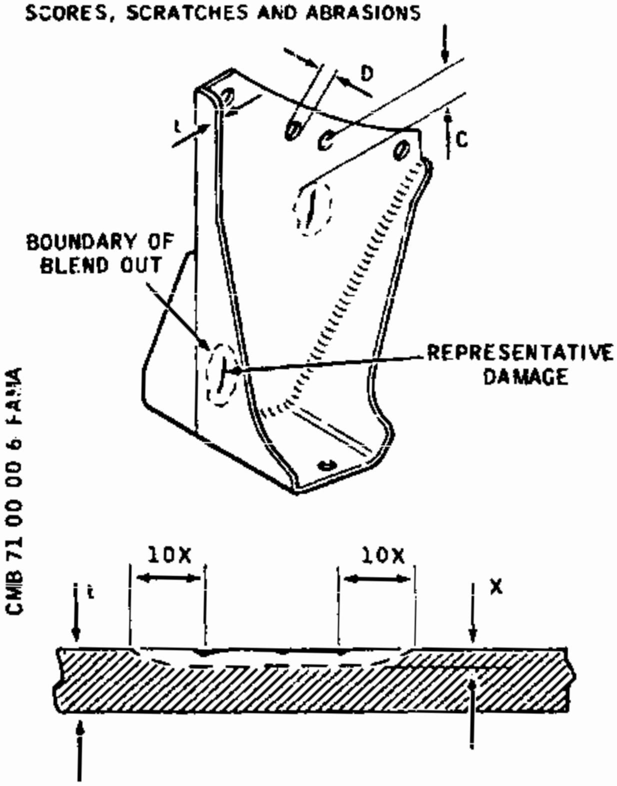


CMB 71 00 00 6 EAMC

CRACKS	NOT PERMITTED SMALL EDGE OR SURFACE CRACKS ARE ACCEPTABLE WITHIN THE LIMITATIONS OF DAMAGED EDGES DAMAGED CORNERS OR SCORES ABRASION AND MILD CORROSION

Permissible Damage - Fittings, Brackets, Cleats - Table 604 (Sheet 3 of 3)

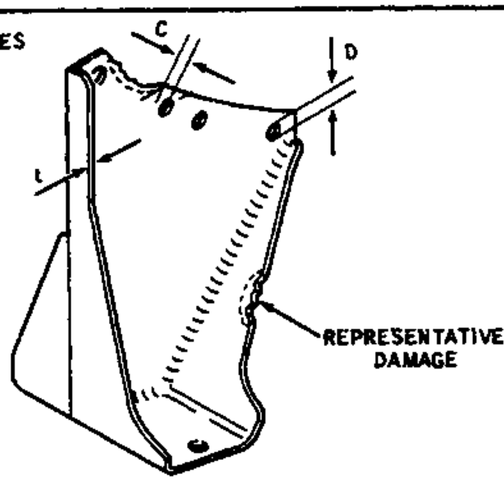
R

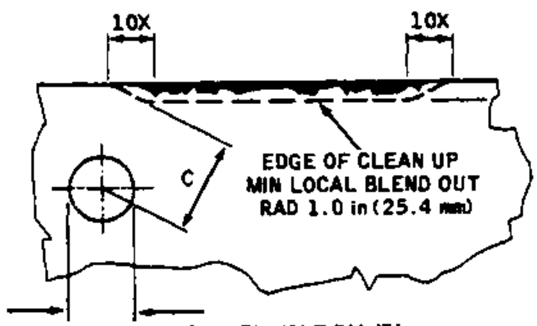
DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
SMOOTH DENTS (FOR t = 0.064 in (1.65 mm) MAX.) 	DENTS ARE NOT PERMITTED IN FLANGES AND ARE NOT TO RUN INTO BEND RADIUS OR WELDED AREA $d = \frac{t}{2}$ OR 0.03 in (0.76 mm) MAX. WHICHEVER IS SMALLER R = 5t MIN. AREA MUST BE CRACK DETECTED CHECK ADJOINING FASTENERS FOR SECURITY AND RETIGHTEN OR RE-RIVET WHERE NECESSARY AND SEAL, IF REQUIRED DEPTH OF ASSOCIATED SCORES MUST NOT EXCEED $\frac{t}{20}$ BLEND OUT SCORES
SCORES, SCRATCHES AND ABRASIONS 	$X = \frac{t}{10}$ OR 0.005 in (0.127 mm) MAX. WHICHEVER IS SMALLER C = MIN. EDGE DISTANCE (DIA.D) AFTER BLENDING OUT AREA MUST BE CRACK DETECTED AND REPROTECTED IF NECESSARY t = LOCAL THICKNESS

R Permissible Damage-Stainless Steel Sheet Rolled and Formed Members - Table 605 (Sheet 1 of 2)

DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
DAMAGED EDGES	X = 0.05 in (1.27 mm) MAX. MIN. C EDGE DISTANCE:- PLAIN HOLES = 1.8D COUNTERSUNK HOLES RIVETS = 2.2D BOLTS = 2.0D REMOVE FASTENERS AS REQUIRED TO GAIN ACCESS, THEN RE-RIVET AND SEAL, IF REQUIRED DAMAGE TO BE BLENDED OUT AS SHOWN AND AREA CRACK DETECTED C = MIN.EDGE DISTANCE (DIA.D) D = FASTENER HOLE DIA. t = LOCAL THICKNESS

CB 09430/00A





DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
CRACKS	NOT ALLOWED SMALL EDGE CRACKS ARE TO BE TREATED AS DETAILED IN DAMAGED EDGES
LOOSE FASTENERS AND/OR DEFORMED HOLES	REFER 51-31-11, REPAIR

CMB 71 00 00 6 FAMB

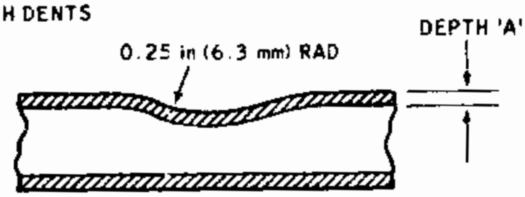
R Permissible Damage-Stainless Steel Sheet Rolled and Formed Members - Table 605 (Sheet 2 of 2)

T55, CM76, CM84, CM231, BACM175

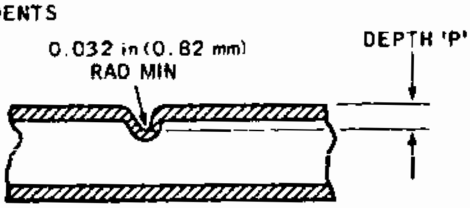
THIS TABLE DEALS WITH PERMISSIBLE DAMAGE ON CORROSION RESISTANT STEEL PIPES, WHICH COULD OCCUR IN SERVICE.
THE LIMITS ARE THE RESULT OF ARBITARY TEST DATA OBTAINED UNDER LABORATORY CONDITIONS AND SHOULD BE USED AS A GUIDE ONLY IN DETERMINING WHEN TUBING OPERATION LIMITS ARE BEING APPROACHED. THEY ARE NOT TO BE CONSIDERED AS SPECIFIC CRITERIA FOR A GO-NO-GO ACCEPTANCE OF DAMAGED TUBING.
FOR FLATTENING AND BENDING TO TUBES, REFER TO 20-23-23, FIGURE 012.

CB 09431/00A

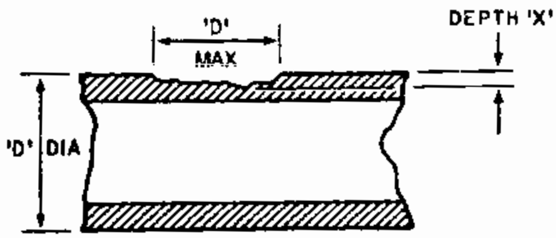
DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
SMOOTH DENTS	CAUSED BY COMPRESSION OR IMPACT WITH A FLAT OR SHALLOW CURVED OBJECT. (CHECK FOR CRACKS).



DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
SHARP DENTS	CAUSED BY IMPACT WITH CORNER OF TOOL ETC. (SMALL AREA - CHECK FOR CRACKS).



DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
CHAFING SCORES & NICKS	DAMAGE TO BE BLENDED OUT. REMOVE THE CAUSE OF DAMAGE. (CHECK FOR CRACKS) AREA IS TO BE IDENTIFIED (PAINT). NO FURTHER DAMAGE ALLOWED.



DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
CRACKS	NOT ALLOWED.

CMB 71 00 00 6 GAMA

R

Permissible Damage - Pipes

DIAMETER in	mm	THICKNESS in	mm	'A' SMOOTH DENTS in	mm	'P' SHARP DENTS in	mm	"X" CHAFING in	mm
1/4	6.35	.018	0.46	.003	0.076	.007	0.178	.001	0.025
		.028	0.70	-	-	-	-	.0014	0.036
5/16	7.94	.018	0.46	.0035	0.09	.007	0.178	.001	0.025
		.028	0.70	.003	0.076	-	-	.0014	0.036
		.048	1.2	-	-	-	-	.0024	0.061
3/8	9.52	.018	0.46	.0035	0.09	.007	0.178	.001	0.025
		.028	0.70	.003	0.076	-	-	.0014	0.036
1/2	12.7	.018	0.46	.0047	0.12	.008	0.203	.001	0.025
		.028	0.70	.004	0.102	.005	0.127	.0014	0.036
5/8	15.9	.018	0.46	.0063	0.16	.010	0.25	.001	0.025
		.028	0.70	.006	0.152	.007	0.178	.0014	0.036
		.048	1.22	.005	0.127	-	-	.0024	0.061
3/4	19.0	.018	0.46	.0079	0.20	.011	0.279	.001	0.025
		.028	0.70	.007	0.178	.008	0.203	.0014	0.036
		.056	1.42	.005	0.127	-	-	.0028	0.061
1	25.4	.020	0.51	.0079	0.20	.011	0.279	.001	0.025
11/4	31.7	.022	0.56	.0079	0.20	.011	0.279	.0011	0.028
		.036	0.90	.007	0.178	.010	0.25	.0018	0.046
11/2	38.1	.022	0.56	.0079	0.20	.011	0.279	.0011	0.028
		.036	0.90	.0075	0.19	.011	0.279	.0018	0.046

Permissible Damage - Pipes
Table 606

11. Action to be Taken After Engine Storage

R NOTE: Refer to next para. - Action to be taken to reduce
R the risk of oil pressure filter blockage due to the
R shedding of carbon and/or anti-wear additive.

A. General

For details of procedure for storing engines removed from aircraft refer to Chapter 70-00-07.

The risk of carbon shedding from the HP turbine bearing area has been shown to be associated with the re-use of engines following prolonged storage. This can lead to blockage of filters and the HP turbine bearing oil feed jet with possible engine shutdown.

The storage of engines with a known history of carbon generation in the HP turbine bearing area should be avoided and where possible engines in this category should be returned for cleaning to Overhaul standard and modification.

Engines following storage in the open air, particularly whilst still installed in aircraft, are at high risk for subsequent carbon shedding after re-use. The immediate re-use of such engines should be restricted to a maximum of three in any one aircraft.

B B. Storage period in excess of 2 weeks.

B Note: The term 'storage' includes periods of inactivity
B due to extended aircraft maintenance checks.

B (1) Carry out the following procedure.

B (a) Remove and inspect the main oil pressure filter,
B the LP and the HP turbine scavenge filters
B (Ref.72-01-00, Servicing). If carbon is present
B repeat the ground run (Ref para.D (3)) after
B cleaning and re-installing filters. Repeat
B ground runs until no carbon is collected in the
B filters. Change engine oil if significant
B amounts of carbon are collected (Ref.79-00-01).

(b) After completion of engine runs, and regardless of whether or not carbon has collected in the filters, raise an ADD to the effect that the main pressure filter, the LP and the HP turbine scavenge filters are removed and inspected for contamination (Ref.72-01-00, Servicing) at each LHR visit for the first 25 hours of engine operation following re-entry into service, or until the filters show no evidence of carbon, whichever is the latter.

(c) If the filters show any evidence of carbon contamination during any inspection carried out as per the ADD requirement, ground running of the engine should be carried out as per paragraph B.(1)(a) above.

<u>Note:</u> After an engine re-enters service after an extended lay-off period, any flight crew reports on oil pressure abnormalities or oil loss problems is reason to suspect oil filter blockage or contamination of the relief valve.

<u>Note:</u> The HP and LP turbine scavenge filters may also be referred to as the No.4 and No.5 bearing scavenge filters respectively.

C. Storage period in excess of 8 weeks.

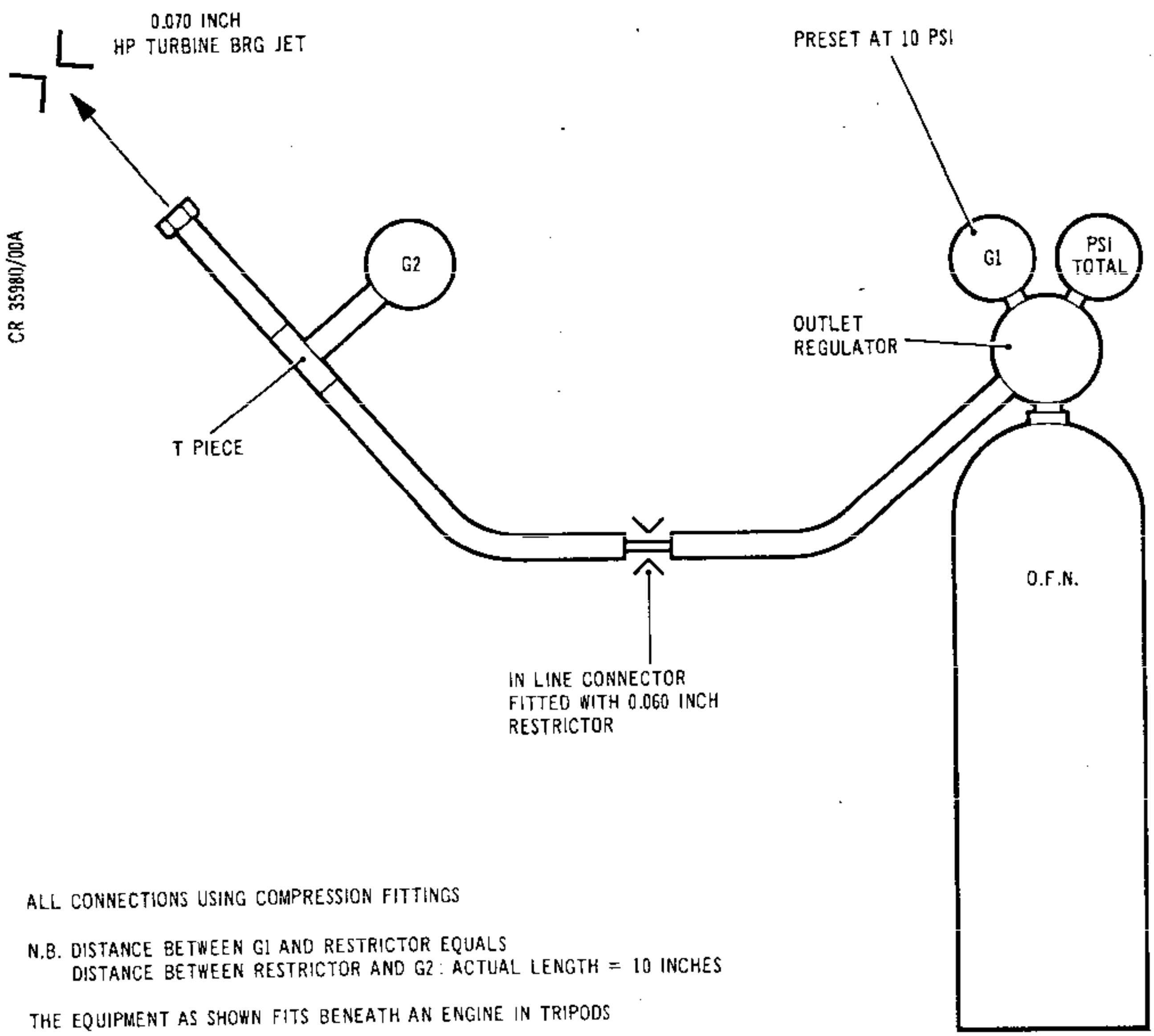
(1) After satisfactory completion of the installation ground run checks, shut down the engine (Ref.71-00-00 Adjustment/Test, para.9, Test 19 or 19a as applicable).

(2) Carry out procedure as defined in para.B.(1).

(3) For engines with HP turbine bearing area cleaned more than 500 hours before storage, carry out an HP turbine bearing oil feed continuity check (Ref. Fig.603).

<u>Note:</u> Carry out this check after the ground run when carbon could have shed and blocked or restricted the HP turbine bearing feed jet. This check pressurises the jet by a Nitrogen bottle and connection into the feed line is made at the delivery case vane end position.

(a) Connect the oil feed continuity test equipment S3S.14402000 to the HP turbine bearing feed tube (Fig.603).



ALL CONNECTIONS USING COMPRESSION FITTINGS

N.B. DISTANCE BETWEEN G1 AND RESTRICTOR EQUALS
DISTANCE BETWEEN RESTRICTOR AND G2 : ACTUAL LENGTH = 10 INCHES

THE EQUIPMENT AS SHOWN FITS BENEATH AN ENGINE IN TRIPODS

Diagramatic View of Tool S3S.14402000
Figure 603

R

B (b) Set gauge 1 to read 10 psi (69 kPa). With a normal unrestricted HP turbine bearing feed jet the gauge 2 pressure reading should be between 4-6 psi (27.6-41.5 kPa). Reject the engine and clean the HP turbine bearing area if the gauge 2 pressure reading exceeds 6 psi (41.5 kPa).

B (c) When an acceptable reading is obtained remove the oil feed continuity test equipment and reconnect the engine services.

(4) Engines with HP turbine bearing area cleaned more than 500 hours before storage should undergo the checks defined in para.C.(1) plus the following:

(a) Carry out an HP turbine bearing oil feed continuity check (Ref.Fig.1) after the ground run (Ref.para.D.(3)).

<u>Note:</u> Carry out this check after the ground run when carbon could have shed and blocked or restricted the HP turbine bearing feed jet. This check pressurises the jet by a Nitrogen bottle and connection into the feed tube is made at the delivery case vane end position.

(i) Connect the oil feed continuity test equipment S3S.14402000 to the HP turine bearing feed tube (Fig.603).

(ii) Set gauge 1 to read 10 psi (69 kPa). With a normal unrestricted HP turbine bearing feed jet the gauge 2 pressure reading should be between 4-6 psi (27.6-41.5 kPa). Reject the engine and clean the HP turbine bearing area if the gauge 2 pressure reading exceeds 6 psi (41.5 kPa).

(iii) When an acceptable reading is obtained remove the oil feed continuity test equipment and reconnect the engine services.

D. Ground Run Procedure

NOTE: The following is in alignment with the Restricted Speed Bands. Refer to 71-00-00, Page 520, para.5.B.

(1) Engines installed in bays 1, 2 and 3.

(a) The ground run should consist of 3 successive excursions to take-off power for 1.5 minutes, with 1 minute intervals at idle between take-off runs and at least 5 minutes at idle after the last take-off run.

(b) The remainder of the running may be at idle or at conditions required for other reasons.

(c) The total ground run should be of at least 30 minutes duration.

(2) Engines installed in bay 4.

(a) The ground run should consist of two runs to take-off power for 30 seconds (max.) with a 5 minute period at idle between them, followed by a minimum of 5 minutes at idle.

(b) The total ground run should be of at least 30 minutes duration.

(3) For any subsequent ground runs, the running defined in D.(1)(a) or D.(2)(a) as applicable should be repeated.

R 12. Action to be Taken to Reduce the Risk of Oil Pressure Filter
R Blockage due to the Shedding of Carbon and/or Anti-Wear
R Additive

R NOTE 1: Refer to previous para. - Action to be taken after
R engine storage, for associated information before
R referring to the information detailed in this para.

R NOTE 2: Select the relevant information from that detailed
R below to suit the aircraft/engine conditions being
R experienced.

R A. Maintenance actions to reduce the risk of pressure filter
R blockage - Normal Operation.

R (1) Inspect and clean, regardless of visual appearance,
R the main oil pressure filter in accordance with the
R procedure detailed in the Maintenance Manual,
R Chapter 72-01-00 at a maximum periodicity of 250 hrs.

B. Maintenance actions to reduce the risk of pressure filter blockage - Engine exhibiting HOC.

(1) When the average oil consumption over 10 flights is greater than 1.2 US qts/hr inspect the main pressure filter every 25 hrs in accordance with the procedure detailed in the Maintenance Manual, Chapter 72-01-00.

(2) If during the inspection detailed previously in para.(1) the engine exhibits Anti-Wear Additive problems, further inspection must be carried out every 25 hrs until HOC has been reduced to an acceptable level. The engine must then prove to be trouble free in respect of filter contamination, for 100 hrs before inspections revert to those detailed in para.A.(1).

C. Maintenance actions to reduce the risk of pressure filter blockage - Engines with high lives since bearing chamber refurbishment.

(1) Engines with 2000 hrs operation since No.4 bearing chamber clean, must have the main oil pressure filter inspection carried out every 25 hrs in accordance with the procedure detailed in Chapter 72-01-00.

D. Maintenance actions following inactivity e.g. Aircraft Maintenance - Where engines stored in or out of the aircraft are to be returned to service it is recommended that wherever possible no more than one engine per wing should exceed 1000 hours since turbine bearing chamber refurbishment.

E. Maintenance actions following inactivity e.g. Aircraft Maintenance - Special Inactivity Checks detailed in para.K. must be carried out after 2 weeks of inactivity in a hangar or 7 days outside a hangar in the following cases:

(1) Engines with greater than 1000 hrs life since turbine bearing chamber refurbishment.

(2) Engines with oil consumption averaging over 1.2 US qts/hr over the previous 10 flights.

F. Maintenance actions for engines installed in aircraft selected for World Tours and Special Charters - When aircraft are chosen for a World tour or charters involving several days stood outdoors, particularly in humid climates, no more than one engine per wing should be fitted which has a life greater than 1000 hrs since turbine bearing chamber clean or oil consumption greater than 1.2 US qts/hr.

G. Maintenance actions for engines installed in aircraft selected for World Tours and Special Charters - Prior to departure or in the preceding 25 hrs all four engines should have their pressure filters checked and cleaned.

H. Maintenance actions for engines installed in aircraft selected for World Tours and Special Charters - If the aircraft is stood outdoors for more than 7 days, the highest life engine of any over 1000 hrs since bearing chamber refurbishment must have the special inactivity checks detailed in para.K. carried out, except that only the pressure filter should be inspected and cleaned. In the event that aqueous cleaner is not available then boiling water may be used. If contamination is found then the scavenge filters should also be checked. Ground running and filter checks should be repeated until filters are clear.

J. Maintenance actions for engines installed in aircraft selected for World Tours and Special Charters - Where periods of a few days inactivity occur at several stops it is recommended that the pressure filters of high risk engines are inspected in rotation on a maximum of one engine at any one stop.

K. Special Inactivity Checks - Ground Run of a least 1 min at idle, 20 min at 90% N_2 with E_{LOW} selected, 5 min at idle, all with the fuel heater selected on. Normal installation ground running at 85% N_2 or above, preferably with the fuel heater on, this may count towards this. Following ground running, all filters should then be inspected and cleaned in aqueous cleaner as per the procedure detailed in Chapter 72-01-00 (particularly important on pressure filter). If any carbon or sticky deposit is found, then the ground run and filter checks should be repeated until no further deposits are found. The pressure filter should then be inspected and cleaned on the next 2 occasions the aircraft returns to main base or until no more deposits are found, whichever is the greater. In addition any engine exhibiting either type of deposit should have its pressure filter inspected and cleaned every 25 hrs. Return to the inspection periodicity detailed in para.B. after 100 hrs with no deposits.

L. Engine Storage:

(1) Engines removed from the aircraft must be stored in accordance with the procedures detailed in Chapter 70-00-07.

(2) Engines that remain installed in the aircraft but are subject to periods of inactivity must be blanked in accordance with the procedures detailed in Chapters 10-11-00 and 12-21-01.

13. <u>Inspection/Check of Engine Bay and Nacelle following Overheating caused by Lack of Cooling Air Flow</u>

<u>WARNING:</u> OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00, SERVICING.
WHEN ENTERING THE ENGINE AIR INTAKE AND THE TWIN SECONDARY NOZZLE FOLLOW THE PROCEDURES GIVEN IN 71-00-00, SERVICING. DO NOT ENTER A NOZZLE JET PIPE WITH AN AIR SUPPLY CONNECTED TO EITHER OF THE GROUND CONNECTIONS IN A NACELLE.

A. Prepare to Inspect

(1) Open the engine bay forward and rear door lower and side panels.

B. Inspect

(1) Engine bay and nacelle.

(a) Visually examine for evidence of overheating on roof, centre wall panels, twin secondary nozzle bulkhead and engine bay doors.

(b) Visually examine for evidence of overheating on engine and twin secondary nozzle mountings and struts.

(c) Visually examine for evidence of overheating of all aircraft mounted components.

(d) Visually inspect conduits, cables and connectors. (Refer to para.10 and Table 601, Pages 623 to 625 incl.).

(e) Visually inspect for overheating of bucket pneumatic drive actuator, crossfeed isolation valve and associated equipment.

(f) Examine the temperature sensitive wire on the side plate assembly and replace as necessary. (Refer to 71-32-17, Removal/ Installation).

(2) Engine and Reheat Jet Pipe.

(a) Visually examine for evidence of overheating of all engine mounted components and accessories.

(b) Visually examine conduits, looms cables and connectors.

(c) Visually inspect reheat jet pipe to engine attaching and securing links.

NOTE: If engine bay/nacelle overheating condition was caused by malfunction of the secondary air door system, the C.E.S.O. Service Centre must be notified for recommendations regarding further actions to be taken.

C. Service.

(1) Primary Nozzle Control Trim Unit.

(a) Drain and refill Trim Unit, Refer to 76-13-11, Servicing.

D. Rectification.

(1) When the cause of overheating has been established, carry out the necessary rectification as detailed in the relevant MM Chapter.

E. Conclusion.

(1) Repair or replace damaged cables as required.

(2) Carry out a functional or operational test as appropriate for all electrical circuits disconnected during the inspection procedures.

(3) Close the engine bay doors (Ref. 71-00-00, Servicing).

R 14. Inspection/Check of Engine Mounts following a Rapid Deceleration of the Engine and Seizure of either Rotating Assembly

A. General

The following checks are essential after a report of rapid deceleration of the engine and seizure of either rotating assembly, or where distortion of the main link is evident. The Inspection/Check consists of two sections:

(1) Visual Inspection (Ref. 71-21-00 Inspection/Check, SRM 54-42-00 Table 301).

(2) Non-Destructive Testing (NDT Manual, Part 6).

NOTE: When suitable NDT equipment is not available, the aircraft may be ferried to base for the NDT check, providing that the Visual Inspection is satisfactory. This task is to be carried out in conjunction with 71-00-12 Removal/Inspection, para.3 following engine removal.

B. Visual Inspection

(1) Equipment and Materials

DESCRIPTION	PART NO.
Lint free cloth	-
Straight edge, 1m	-

(2) Prepare to Inspect

(a) Remove heatshields from mounting attachments.

(b) Wipe the mounts, where necessary, with clean lint free cloth.

(3) Inspect

(a) Visually inspect airframe parts of engine mounting for damage (Ref. 71-21-00 Inspection/Check, para. 2.C. and SRM 54-42-00 Table 301).

(b) Inspect the attachment locations for the engine main, front and "Y" spigot mountings with the thrust balance crosshaft and levers for damage.

(c) Inspect the surrounding area for skin deformation and scorch marks.

(d) Inspect attachment of nacelle and nozzle assembly.

(e) Inspect Engine Mounts (Ref. 71-21-00, Inspection/Check, para 2.D.).

C. Non-Destructive Testing

(1) Equipment and Materials

DESCRIPTION	PART NO.
Penetrants - post emulsified fluorescent	-
Lamp U.V.- high intensity 125 watt self filtered	-
Magnetic flaw detection equipment including demagnetising facility	-
Eddy current testing equipment - HF	-

(2) Prepare to Inspect

(a) Remove vertical links and fail safe tie-rods (Ref. 71-21-14 Removal/Installation).

(b) Remove the two forward mount assemblies from engine (Ref.71-21-00, Removal/Installation).

(c) Remove the restraint spigot bracket assembly from engine (Ref. 71-21-00, Removal/Installation).

(3) Inspect

(a) Carry out testing of components listed in Tables 1 to 4 to the stated procedures, paying particular attention to lugs and points of attachments (Ref. OHM 20-57-02, 20-57-03 and NDT Manual).

(b) Further to visual inspection para. B.(3)(b) where deformation is found, carry out inspection on wing skin. (Ref. NDT Manual 51-00-00, High Frequency Eddy Current - Surface Scanning).

NOTE: The results of the inspections described above must be communicated to the Constructor.

D. Rectification/Assembly

(1) Repair or replace components as necessary.

E. Assembly

(1) Install vertical links and fail safe tie-rods. (Ref. 71-21-14 Removal/Installation and 71-21-13 Removal/Installation).

(2) Install the front mount assemblies on engine. (Ref. PPBU 71-00-02 Figure 4).

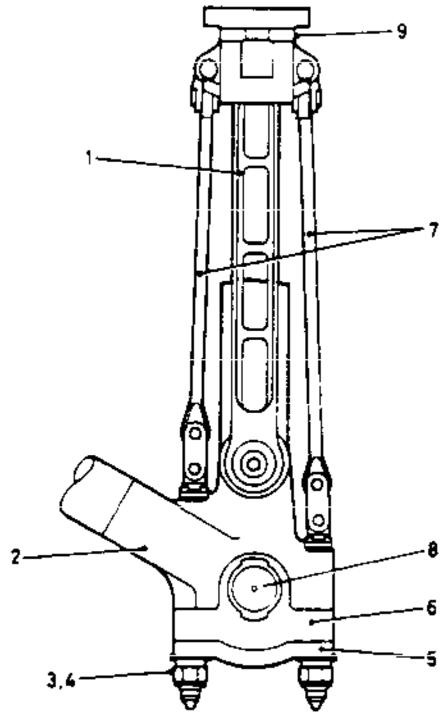
(3) Install the restraint spigot bracket assembly on engine. (Ref. PPBU 71-00-02 Figure 5).

(4) Install heat shields removed in para. 13. B. (2) (a).

F. Conclusion

(1) Carry out operational or functional test as appropriate for all electrical circuits disconnected during the Inspection procedure. (Ref. 24-00-00 Adjustment/Test).

(2) Install the engine. (Ref 71-00-12 Removal/Installation para. 4).

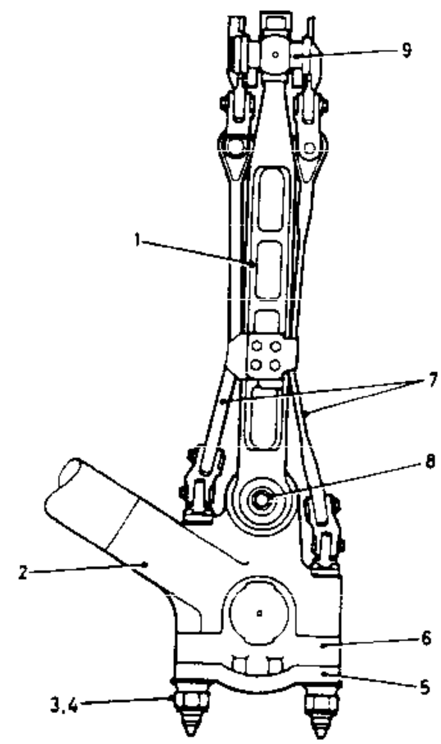


Side Main Mounting
Figure 601

Item No.	Description	NDT Process
1	VERTICAL LINK	OHM 20-57-02
2	THRUST STRUT	OHM 20-57-02
3	TRUNNION BOLT	OHM 20-57-03 M1 & 3
4	TRUNNION BOLT	OHM 20-57-03 M1 & 5
5	FAILSAFE STRAP	OHM 20-57-02
6	BEARING HOUSING	OHM 20-57-02
7	FAILSAFE TIE-RODS	OHM 20-57-03 M1, 3 & 5
8	PIN	OHM 20-57-03 M1 & 5
9	BRACKET	OHM 20-57-02

NOTE : During inspection of the thrust strut assembly particular attention should be made to the manufacturing joint areas.

Table 1

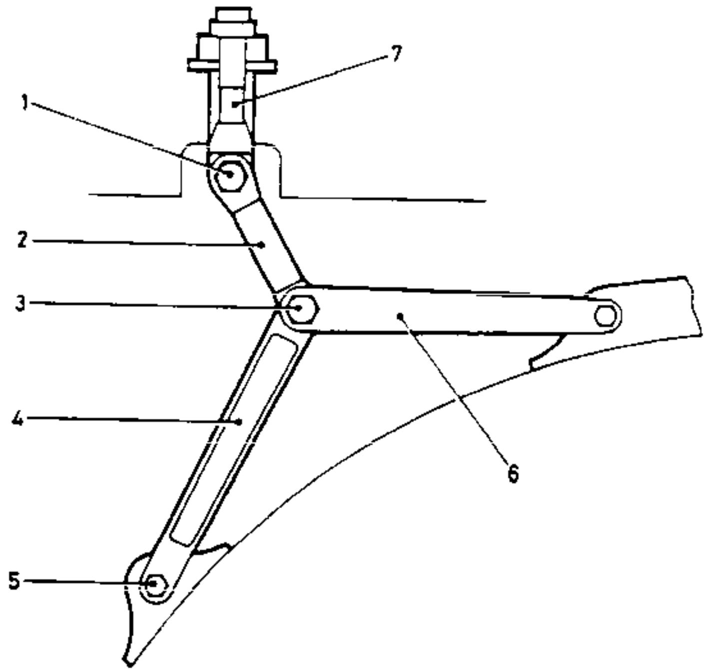


Centre Main Mounting
Figure 602

Item	Description	NDT Process
1	VERTICAL LINK	OHM 20-57-02
2	THRUST STRUT	OHM 20-57-02
3	TRUNNION BOLT	OHM 20-57-03
4	TRUNNION BOLT	OHM 20-57-03
5	FAILSAFE STRAP	OHM 20-57-02
6	BEARING HOUSING	OHM 20-57-02
7	FAILSAFE TIE-RODS	OHM 20-57-03 M1, 3 & 5
8	PIN	OHM 20-57-03
9	BRACKET	OHM 20-57-02

NOTE : During inspection of the thrust strut assembly particular attention should be made to the manufacturing joint areas.

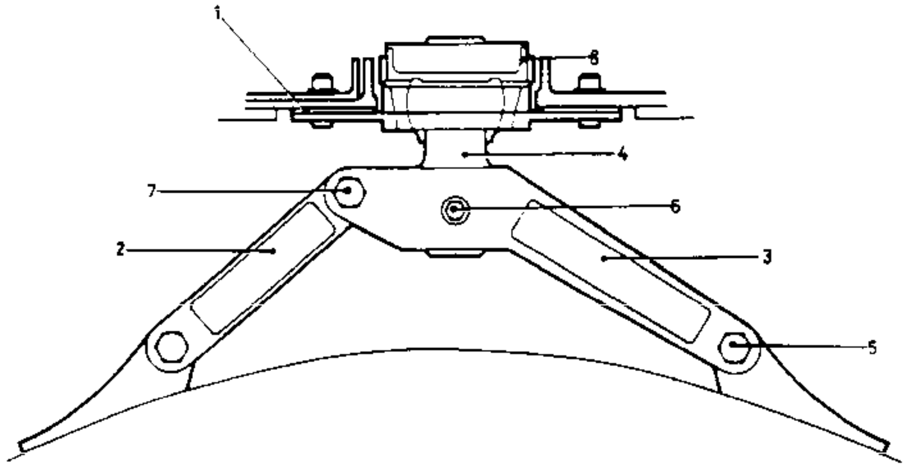
Table 2



Front Engine Mountings
Figure 603

Item No.	Description	NDT Process
1	BOLT	OHM 20-57-03 M1 & 3
2	LINK	OHM 20-57-02
3	BOLT	OHM 20-57-03 M1 & 3
4	LINK	OHM 20-57-02
5	BOLT	OHM 20-57-03 M1 & 3
6	LINK	OHM 20-57-02
7	CLEVIS	OHM 20-57-02

Table 3



Lateral Restraint Spigot Spar 68
Figure 604

Item No.	Description	NDT Process
1	'Y' RESTRAINT MOUNTING	OHM 20-57-01
2	LINK	PHM 20-57-03 M1, 3 & 5
3	LINK	OHM 20-57-03 M1 & 3
4	SPIGOT	OHM 20-57-03 M1 & 3
5	BOLT	OHM 20-57-03 M1 & 3
6	BOLT	OHM 20-57-03 M1 & 3
7	BOLT	OHM 20-57-03 M1 & 3
8	RETAINING NUT	OHM 20-57-03 M1 & 5

Table 4

POWER PLANT - CLEANING/PAINTING

WARNING: OBSERVE THE SAFETY PRECAUTIONS FOR ENTERING THE ENGINE AIR INTAKE, OPENING THE ENGINE BAY DOORS, AND ENTERING THE TWIN SECONDARY NOZZLE, AS APPROPRIATE (REF. 71-00-00
R SERVICING). OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS . (REF. 24-00-00)

1. General

The power plant must be cleaned as soon as possible following use of fire extinguishants. For the engine, the cleaning procedures are applicable only for contamination externally by an extinguishant.

The extinguishant used in the aircraft system is a halogenated vaporizing fluid, Bromochlorodifluoromethane (B.C.F.). The four main categories of ground equipment extinguishant are, halogenated vaporizing fluids (M.B., C.T.C., C.B., B.C.F. and B.T.M.), carbon dioxide ($CO2$), dry powder (mainly fine sodium or potassium bicarbonate) and foam (mainly fluorochemical, fluorinated protein and standard protein).

2. Procedure After Discharge of Aircraft System Extinguishant

R A. Clear Extinguishant from Engine

WARNING: DO NOT INHALE VAPOUR. DO NOT ALLOW EXTINGUISHANT TO COME INTO CONTACT WITH SKIN OR EYES. VAPORIZING FLUIDS ARE EXTREMELY TOXIC BOTH BY INHALATION AND SKIN ABSORPTION. TOXICITY IS GREATLY INCREASED WHEN CHEMICALS DISSOCIATE IN CONTACT WITH HOT ENGINE COMPONENTS.

(1) Wear protective gloves and eyeshields, and open the
R engine bay door lower and side panels (Ref.71-00-00,
R Servicing).

NOTE: Spillage may occur from extinguishant that has collected in pockets in the doors especially when the extinguishant has been accidentally discharged over a cold engine.

(2) Leave doors open and ventilate as much as possible for at least 30 minutes to disperse all vapours.

R (3) In ambient temperatures below 0 deg C (32 deg F), the
R engine/engine bay is to be force ventilated with
R clean dry and preferably warm air, and excess BCF
R fluid wiped away with a clean lint-free cloth and the

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cloth disposed of.

(4) Ascertain the circumstances under which the extinguishant was discharged and proceed accordingly as in para.2, operations (5), (6) or (7).

(5) If no fire has occured:

(a) Check the fire detection and extinguisher systems for inadvertent operation, and rectify as required.

(b) Remove used extinguisher bottles and purge the system pipelines to each spray nozzle (Ref. 26-21-00, Adjustment/Test) then fit new extinguisher bottles (Ref.26-21-11, Removal/Installation) as necessary.

(c) Position the appropriate BLEED VALVE control switch, on the AIR BLEED CONTROL panel 2-214, to "SHUT", to prevent, as far as possible, fumes entering the passenger compartment, then start the engine (Ref.71-00-00, Adjustment/Test). Run the engine at normal operating temperature and at idling speed to quickly disperse BCF liquid and vapour. Shut-down the engine, and reset the BLEED VALVE control switch to "OPEN".

(6) If a minor fire has occurred with little or no damage:

(a) Verify that the work area is clear of extinguishant and its products then, if the fire was local and of low intensity, examine the engine and rectify as necessary.

(b) Check the fire detection and extinguisher systems, restore the extinguisher system to a serviceable condition and run the engine as detailed in para.2, operation (5). Prior to engine running, carry out an operational test on the fire, nacelle overheat and torching flame detection and the extinguisher systems (Ref. 26-11-00, 26-12-00, 26-14-00, 26-21-00, Adjustment/Test).

(c) Inspect the drain holes and drain assemblies associated with the engine bay doors as detailed in 54-00-11, Inspection/Check.

(7) After a fire necessitating engine rejection:

(a) Ensure that all extinguishant has been cleared, then remove the engine (Ref.71-00-12, Removal/Installation) for packaging/stripping/cleaning.

NOTE: When packaging, a dessicant (silica gel) must be included in the package together with a statement indicating the type of contaminating extinguishant.

(8) When the power plant has been cleared for service, close the engine bay doors (Ref.71-00-00, Servicing), concurrent with necessary investigation, rectification and power plant checks.

3. Procedure After Use of Ground Equipment Extinguishants on Engine Air Intake

A. Equipment and Materials

DESCRIPTION	PART NO.
R Cleaner, Ardrox 6025T (Ref.20-30-00, No. 455)	-
Solvent BACM302 (Ref. 20-30-00, No. 473)	-
Sodium dichromate (Ref. 20-30-00, No. 461)	-
Engine face cover	PE12325
Clean, low pressure water supply and spray nozzle	-
Servicing platform	-
Explosion-proof lamp	-
Breathing equipment	-
Ventilation equipment	-
Suction equipment	-
Eyeshield and gloves	-

B. Cleaning Procedure

<u>WARNING:</u> ENTER THE APPROPRIATE ENGINE AIR INTAKE AND OPEN THE ENGINE BAY DOORS IN ACCORDANCE WITH THE INSTRUCTIONS GIVEN IN 71-00-00, SERVICING. BREATHING EQUIPMENT IS TO BE USED WHEN CLEANING WITH SOLVENT BACM 302.

<u>CAUTION:</u> POWDER AND FOAM EXTINGUISHANTS ARE CORROSIVE TO LIGHT ALLOY STRUCTURE.

(1) Open the appropriate engine bay forward doors.

(2) Remove the rubber grommet from each of the drain holes in the bottom surface of the intake.

(3) Wearing an eyeshield and gloves and using the servicing platform to gain access into the engine air intake, thoroughly clean the contaminated areas with a clean cloth moistened with solvent.

<u>NOTE:</u> In areas where extinguishant is difficult to remove, apply Ardrox cleaner with a bristle brush using a gentle scrubbing action. Allow the cleaner to remain on the surface for approximately 15 minutes, then thoroughly wash the surface with clean cold water to remove the cleaner and dry with a clean lint-free cloth. Do not damage the paintwork.

(4) If a powder or foam extinguishant has been used, flush the internal structure as follows:

(a) Fit the cover to the engine face.

(b) If a powder extinguishant has been used, remove as much powder as possible using a suction cleaner.

(c) Direct a low pressure water spray into the lower lip bleed (intakes 2 and 3 only), ramp fairings, and spill door surrounds. Also direct the spray over the ramp bleed floor to flush the secondary air flow passages (cascade structure).

(d) Visually examine the structure to ensure that extinguishant has been removed. Also check that all drain channels, bleeds and drain holes are clear.

(e) Flush the structure with a 2 per cent sodium dichromate and clean water solution.

(5) Check that all panels in the engine air intake are secure. If the panels are loose and it is suspected that the interior structure is contaminated by extinguishant, remove the panel and clean the structure as detailed in operations (3) and (4) as appropriate.

(6) Ventilate the engine air intake, and the internal structure, as necessary, with clean, dry and preferably warm air.

(7) If extinguishant has contaminated the following items, take the remedial action indicated:

DESCRIPTION	REMEDIAL ACTION
Air conditioning intake duct	Clean duct, and function test fire valve (Ref. 26-21-00, Adjustment/Test)
Engine/intake joint rings	Remove rings (Ref.71-21-11, Removal/Installation and clean
Forward and rear ramps	Remove and relubricate hinges (Ref. 71-63-12, Removal/Installation)
Ramp actuator screwjacks	Clean, and relubricate (Ref. 12-22-71)
Secondary air door system	Clean, and operationally test (Ref. 71-31-00, Adjustment/Test)

(8) Remove the cover from the engine face.

(9) Vacate the engine air intake (Ref. 71-00-00, Servicing).

(10) Refit a rubber grommet to each of the drain holes in the bottom surface of the intake.

(11) Close the engine bay doors (Ref. 71-00-00, Servicing).

4. Procedure After Use of Ground Equipment Extinguishants on Engine

CAUTION: THE USE OF EXTINGUISHANTS IN FIRE FIGHTING RESULT IN CONTAMINATION OF PARTS BY CORROSIVE ACIDIC PRODUCTS REQUIRING THAT THE POWER PLANT BE PERIODICALLY MONITORED FOR CORROSION IRRESPECTIVE OF THE CLEANING PROCEDURE USED.

A. General

R Should halogenated vaporizing fluid, dry powder or foam extinguishant contaminate the engine externally or internally, clearing of the extinguishant from the engine will be required.

B. After the use of Halogenated - type Extinguishant

WARNING: DO NOT INHALE VAPOUR. DO NOT ALLOW EXTINGUISHANT TO COME INTO CONTACT WITH SKIN OR EYES. VAPORIZING FLUIDS ARE EXTREMELY TOXIC BOTH BY INHALATION AND SKIN ABSORPTION. TOXICITY IS GREATLY INCREASED WHEN CHEMICALS DISSOCIATE IN CONTACT WITH HOT ENGINE COMPONENTS.

(1) After an engine external fire and discharge of existinguishant around the engine:

(a) Wearing protective gloves and eyeshields, open the engine bay door lower and side panels (Ref. 71-00-00, Servicing) taking care not to contaminate the skin or eyes with extinguishant that may have collected in pockets in the doors.

(b) Clear extinguishant from the engine in accordance with para.4B, operations (2) or (3) as appropriate.

NOTE: As a greater quantity of ground equipment fire extinguishant will probably have been used relative to the quantity of aircraft system extinguishant, there is more of a likelihood of corrosive products being present.

(2) If a small quantity of extinguishant has been used resulting in the non-rejection of the engine:

(a) Leave the doors open and ventilate the area as much as possible for at least 30 minutes to disperse all vapours.

(b) In ambient temperatures below 0 deg C (32 deg F), the engine/engine bay is to be force ventilated with clean, dry warm air, and excess BCF fluid wiped away with a clean, lint-free cloth.

(c) Check the fire detection and extinguisher systems for serviceability and rectify as required.

(d) Remove the appropriate fire extinguisher bottles from the aircraft (Ref.26-21-11, Removal/Installation), purge the extinguisher system pipes ensuring that the pipes and spray nozzles are unobstructed (Ref.26-21-00, Adjustment/Test), then fit new extinguisher bottles.

(e) Operationally test the fire, nacelle overheat, and torching flame detection and extinguisher systems (Ref.26-11-00, 26-12-00, 26-14-00, 26-21-00, Adjustment/Test).

(f) Inspect the drain holes and drain assemblies associated with the engine bay doors as detailed in 54-00-11, Inspection/Check.

(g) Position the appropriate BLEED VALVE control switch on the AIR BLEED panel 2-214 to "SHUT" to prevent, as far as possible, fumes entering the passenger compartment, then start the engine (Ref.71-00-00, Adjustment/Test). Run the engine at normal operating temperature and at idling speed to quickly disperse BCF liquid or vapour. Shut-down the engine, and reset the BLEED VALVE control switch to "OPEN".

(3) If a large quantity of extinguishant has been used, resulting in the rejection of an engine:

(a) Clear the extinguishant, check the fire detection and extinguisher systems for serviceability and rectify, if necessary, as detailed in operations (2) (a) to (f) above.

(b) Ensure that all extinguishant has been cleared, then remove the engine (Ref.71-00-12, Removal/Installation) for packaging/stripping/cleaning.

NOTE: When packaging, a dessicant (silica gel) must be included in the package together with a statement indicating the type of the contaminating extinguishant.

(4) When the power plant has been cleared for service, close the engine bay doors (Ref. 71-00-00, Servicing), concurrent with necessary investigations, rectification and engine checks.

C. After Use of Carbon Dioxide.

(1) After discharge of carbon dioxide on the engine, cleaning is not required.

<u>NOTE:</u> Carbon dioxide is a non-corrosive gas and will disperse without trace. It has no detrimental effect on the engine.

D. After Use of Dry Powder.

R (1) Contamination of engine internally.

R (a) Remove engine and return to overhaul base for
R strip/clean/inspection.

R (b) Systems supplied by P3 air could become
R contaminated by extinguishant. As a result
R of this, the following systems, including
R any protective filters, should be checked.

R b1) Primary nozzle control system
R (Ref.76-13-00).

R b2) Thrust reverser system (Ref.78-30-00).

R b3) Air conditioning system (Ref.Concorde
R Maintenance Manual Chap.21-00-00).

R (2) Contamination of engine externally.

R (a) After external contamination with a dry powder extinguishant, remove engine for examination and cleaning.

<u>NOTE:</u> Dry powder extinguishant when in contact with hot engine components may form a glazed deposit.

R (b) Clean engine.

CAUTION: IF EXTINGUISHANT IS NOT COMPLETELY REMOVED IT MAY FORM CORROSIVE PRODUCTS WHICH CAN HAVE A SEVERE EFFECT ON HOT COMPONENTS.

R b1) Remove as much powder as possible with a suction-type cleaner.

R b2) Wash engine with water and remove all traces of extinguishant. The removal of glazed deposits may require vigorous cleaning with hot water.

E. After Use of Foam.

(1) After contamination externally with foam extinguishant, remove engine for examination and cleaning.

CAUTION: FOAM EXTINGUISHANT IS HIGHLY CORROSIVE AND MUST BE COMPLETELY REMOVED.

(2) Wash engine with water to dilute and remove foam.

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5. Procedure After Use of Ground Equipment Extinguishants on Exhaust Assembly

A. General

Cleaning of the exhaust assembly is unnecessary following use of light water, foam or CO2 extinguishants, although if CO2 has been used it is necessay to visually inspect the welded joints on the jet pipe and primary nozzle for cracks.

B. Equipment and Materials

DESCRIPTION	PART NO.
Cleaner, Ardrox 6025T (Ref.20-30-00, No.455)	-
White Spirit (Ref.20-30-00, No.468)	-
Servicing platform	-
Explosion-proof lamp	-
Breathing equipment	-
Ventilation equipment	-
Suction equipment	-
Eyeshield and gloves	-

C. Cleaning following use of BCF or other Halogenated Vapourizing Fluids

(1) For fire in a nacelle -

(a) It is necessary to remove the twin secondary nozzle as soon as possible (Ref. 71-00-13, Removal/Installation).

(b) Thoroughly clean the nozzle attaching parts and the ballscrew jacks and their attachments to the nozzle, using white spirit to avoid permanent contamination of their surfaces which could be carbon covered.

(2) For fire inside the engine where BCF has been used, we recommend that the following procedure is adopted:

(a) Where a run up is practicable within 2 hours, the resulting ventilation is adequate and no further action is called for.

(b) Where the engine cannot be put back into service within the two hours:

(b1) Open the engine doors as soon as the fire is out (Ref. 71-00-00, Servicing).

(b2) Blow compressed air through the areas lying close to the twin secondary nozzle link fittings and the bucket ballscrew compartments.

(b3) Within the next two hours, remove the fairing from the twin secondary nozzle lower middle fitting and clean the upper and lower fittings using white spirit.

(b4) Within the same two hour period, remove the access doors to the bucket ballscrew gearboxes and use white spirit to clean the gearbox bodies and their attachments to the twin secondary nozzle.

D. Cleaning Following use of Dry Powder Extinguishant

WARNING: OPEN THE APPROPRIATE ENGINE BAY DOORS AND ENTER THE APPROPRIATE TWIN SECONDARY NOZZLE IN ACCORDANCE WITH THE INSTRUCTIONS GIVEN IN 71-00-00, SERVICING.

(1) Open the engine bay doors (Ref. 71-00-00, Servicing).

(2) Wearing an eyeshield and gloves, and using a servicing platform to gain entry into the secondary nozzle structure and jet pipe, remove the powder with a suction cleaner. In areas where extinguishant is difficult to remove, apply Androx cleaner with a bristle brush using a gentle scrubbing action. Allow the cleaner to remain on the surface for approximately 15 minutes, then thoroughly wash the surface with clean cold water to remove the cleaner. Dry with a clean lint-free cloth.

(3) Vacate the twin secondary nozzle (71-00-00, Servicing).

(4) Close the engine bay doors (Ref. 71-00-00, Servicing).

(5) Check that the fuel drain hole, in the lowest part of the secondary nozzle inner skin and the associated overboard drain pipe is clear.

ENGINE AIR INTAKES - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL PRECAUTIONS DETAILED IN 24-00-00.

OBSERVE THE HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 29-00-00, SERVICING.

OBSERVE THE SAFETY PRECAUTIONS PRIOR TO ENTERING THE ENGINE AIR INTAKE (REF. 71-00-00,SERVICING).

CAUTION: THE AIRCRAFT MUST BE JACKED AND THE MAIN LANDING GEAR MUST BE RETRACTED TO ALLOW REMOVAL OF THE WING FORWARD INBOARD ATTACHMENT BOLT.

ENSURE THAT THE SECONDARY AIR DOORS ARE CLOSED.

THE NEED FOR CLEANLINESS IN THE INTAKE CANNOT BE TOO STRONGLY EMPHASISED. EVERY PRECAUTION MUST BE TAKEN TO KEEP THE INTAKE FREE OF DEBRIS AND FOREIGN MATTER. ALL DROPPED ITEMS SUCH AS NUTS, WASHERS, SPLIT-PINS, ETC. MUST BE RETRIEVED. AFTER INSTALLATION, CHECK THE INTAKE FOR DEBRIS (REF. 54-00-00, INSPECTION/CHECK).

1. General

The air intake structure is attached to the bottom surface of the wing by one fixed attachment and six freely moving links (Ref. 54-40-00). Removal of the intake necessitates raising of the main landing gear, the use of an adjustable level support trolley and the disconnection of the services and link attachment pins. Access to the connections is by access panels or direct from the intake diffusers.

The following removal/installation procedures apply to both left and right-hand intakes.

R B BA Special Instructions for the removal and installation
R B using special equipment, refer to para.3.

2. Air Intake

A. Equipment and Materials

DESCRIPTION	PART NO.
Intake Ground Handling Equipment:	
Jacking pad, intake LH, forward	

DESCRIPTION	PART NO.
outbd.	E935081305
Jacking pad, intake RH, forward outbd.	E935081306
Jacking pad, intake LH, forward inbd.	E935081307
Jacking pad intake RH forward inbd.	E935081308

After SB 54-036 For A/C 001-007,

Jacking pad, intake LH, forward outbd.	E935081317
Jacking pad, intake RH, forward outbd.	E935081318
Jacking pad, intake LH, forward inbd.	E935081315
Jacking pad, intake RH, forward inbd.	E935081316
Jacking pad, intake aft outbd.	E935081309
Jacking pad, intake aft inbd.	E935081310
Cradle (less floor jacks and castors)	E935081001
Stand (for use with cradle))	E935081002
or)	
Adjustable platform)	Operators supply
Portable hydraulic staging jack	
Sling Available for hire from aircraft manufacturers	T47.32.0086
Cover,intake bottom lip (2)	D926806000
Support blocks, ramp,front (2)	D925212000
Locating tool, centrewall,spar 57	D925368000
Locating tool, rear inboard and outboard links, spar 64 (2)	D925194000
Alignment pin, centrewall, spar 64	E925179101
Alignment pin, centrewall link, spar 59	E925179102
Alignment pin, centrewall link, spar 57	E925179103
Alignment pin, inboard and outboard links,spar 57 (2)	E925179104
Alignment pin, inboard and outboard links, spar 64 (2)	E925179105
Adaptor, torque centrewall, spar 64	E925181000
Adaptor, inboard and outboard link	

DESCRIPTION	PART NO.
pins, spar 64	E925182000
Adaptor, torque centrewall,spar 59	E925178100
Extension, special centrewall, spar 59	E925178101
Extension, 6 in (Britool), centrewall spar 59	
Spanner, attachment bolt nut	14701 NSA 5063/14
Extractor, STA-LOK locking washer	65061 NSA 5064/14
Inserter, STA-LOK locking washer	65062 NSA 5064/14
Handle assembly	E925144000
Ratchet,1/2in square drive (Richmont)	SSDRT1/2
Handle,torque (Richmont),100 to 750 lbf in (1.13 to 8.475 mdaN)	CCM750
Handle torque (Richmont),600 to 1800 lbf in (6.78 to 20.34 mdaN)	LTC 3
Screwdriver, torque, 0 to 50 lbf in (0 to 0.565 mdaN)	-
Molybdenum disulphide (Ref. 20-30-00, No.77)	-
'Neverseez' grease (Ref.20-30-00, No.62)	-
R R Wire,locking,corrosion resistant 0.031 in (0.8 mm) dia	DTD 189
Tape, glasscloth,non-adhesive, 1 in (25.4 mm) wide, DTD5346, NF P32 225 225E	-
Viton sealant PR 1720SM (Ref. 20-30-00, No. 351)	-
Engine face cover	PE 12325
Liquid soap	-

B. Prepare to Remove Intake.

(1) Check that the main and nose landing gear safety locking pins are fitted.

(2) Jack up the aircraft so that there is a clearance of 1 in (25.4 mm) under the nosewheel and the aircraft is level in both the fore-and-aft and the transverse planes, (Ref.7-11-00).

(3) Fully raise the main landing gear (Ref.32-31-00, Adjustment/Test).

(4) Check that the intake ramps are fully down.

(5) Carry out the precautionary procedure necessary prior to entering the air intakes (Ref.71-00-00, Servicing).

(6) In addition to the circuit breakers tripped in the previous operation to make the intake safe for entry, trip the following circuit breakers for the remaining intake services, to make the intake safe for electrical disconnection.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Left Hand Nacelle Engine Air Intakes			
INT 1 IND SUP	5-213	1E531	C 6
INT 2 IND SUP	5-213	2E531	C 7
INT 1 RAMP & SPILL POSN IND	2-213	1E541	E14
INT 2 RAMP & SPILL POSN IND	4-213	2E541	E17
TEST UNIT SUP	13-216	K1754	A 4
TEST PNL SUP	15-216	K1755	C 8
INCIDENCE SENSOR 1 SUP	4-213	1K1900	G17
INCIDENCE SENSOR 2 SUP	2-213	2K1900	C14
SENSOR UNIT 1 SUP	2-213	1K2052	A14
No.1 T1 PROBE HEATER SUP	13-215	1H542	C 9
No.2 T1 PROBE HEATER SUP	14-215	2H542	E 8
WING AND INT NORM CONT AND SUP	15-215	1H1836	D10
LH CYCLIC TIMER CONT	3-213	1H1835	B11
INT 1 REAR RAMP HTR SUP	14-215	1H1415	B 6
INT 1 AUX DOOR D BOX HTR SUP	14-215	1H1411	B 7
INT 2 REAR RAMP HTR SUP	13=215	2H1415	A10
INT 2 AUX DOOR D BOX HTR SUP	13-215	2H1411	A 9
SENSOR UNIT 2 SUP	13-215	2K2052	C15
SENSOR UNIT 3 SUP	4-213	3K2052	C17
SENSOR UNIT 4 SUP	14-216	4K2052	C 5
Right Hand Nacelle Engine Air Intakes			
INT 3 IND SUP	1-213	3E531	G 9
INT 4 IND SUP	1-213	4E531	F 9
INT 3 RAMP & SPILL POSN IND	4-213	3E541	F17
INT 4 RAMP & SPILL POSN IND	2-213	4E541	F14
TEST UNIT SUP	13-216	K1754	A 4
TEST PNL SUP	15-216	K1755	C 8
INCIDENCE SENSOR 1 SUP	4-213	1K1900	G17

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
INCIDENCE SENSOR 2 SUP	2-213	2K1900	C14
SENSOR UNIT 1 SUP	2-213	1K2052	A14
SENSOR UNIT 2 SUP	13-215	2K2052	C15
SENSOR UNIT 3 SUP	4-213	3K2052	C17
SENSOR UNIT 4 SUP	14-216	4K2052	C 5
No.3 T1 PROBE HEATER SUP	14-216	3H542	C14
No.4 T1 PROBE HEATER SUP	13-216	4H542	C11
WING & INT ALTN CONT AND SUP	15-216	2H1836	E14
RH CYCLIC TIMER CONT	15-216	2H1835	D14
INT 3 REAR RAMP HTR SUP	13-216	3H1415	A11
INT 3 AUX DOOR D BOX HTR SUP	13-216	3H1411	A10
INT 4 REAR RAMP HTR SUP	14-216	4H1415	A14
INT 4 AUX DOOR D BOX HTR SUP	14-216	4H1411	A15

(7) Open the engine bay side and lower doors immediately aft of the intakes (Ref. 71-00-00, Servicing).

NOTE: The forward engine door stays, located on the intake structure, will eventually have to be removed; the forward doors will then be supported by the rear doors and additional supports such as a portable hydraulic staging jack must be used to manoeuvre the forward door clear of the intake attachment at spar 64.

(8) Ensure that ground hydraulics power is disconnected and depressurize the green, blue and yellow hydraulic systems (Ref. 29-00-00, Servicing).

C. Remove Intake

(1) Remove the forward and aft intake (transition) rings from between the engines and the intakes (Ref. 71-21-11, Removal/Installation).

(2) Fit the ground protection equipment engine face cover (Ref. 71-00-00, Servicing).

(3) Remove the snubber blocks from the front of the engine bay centre wall (Ref. Fig. 401).

(4) Remove the latch housing from the front of the engine bay centre wall (Ref. Fig. 401).

(5) Disconnect and remove the tapping duct of the air conditioning system at the joint between the intake and the engine (Ref. Fig. 401).

(6) Remove the following heatshields:

(a) At the top of the forward edge of the engine centre wall remove the cornice heat shield abutting the intake (Ref. 71-32-13,Removal/ Installation).

(b) Remove the heatshield shrouds from around the hydraulic pipes.

(c) Remove the underwing firewall panel No. 1 (Ref. 71-32-11, Removal/Installation).

(d) Remove the heatshields from the intake rear inner and outer link fittings (Ref. Fig. 402).

(7) Remove the seal assembly at the top of the forward edge of the firewall (Ref. 54-21-27, Removal/ Installation).

(8) At the intake rear inboard and outboard wing link brackets, remove the adjacent heat shield supports (Ref. Fig. 402).

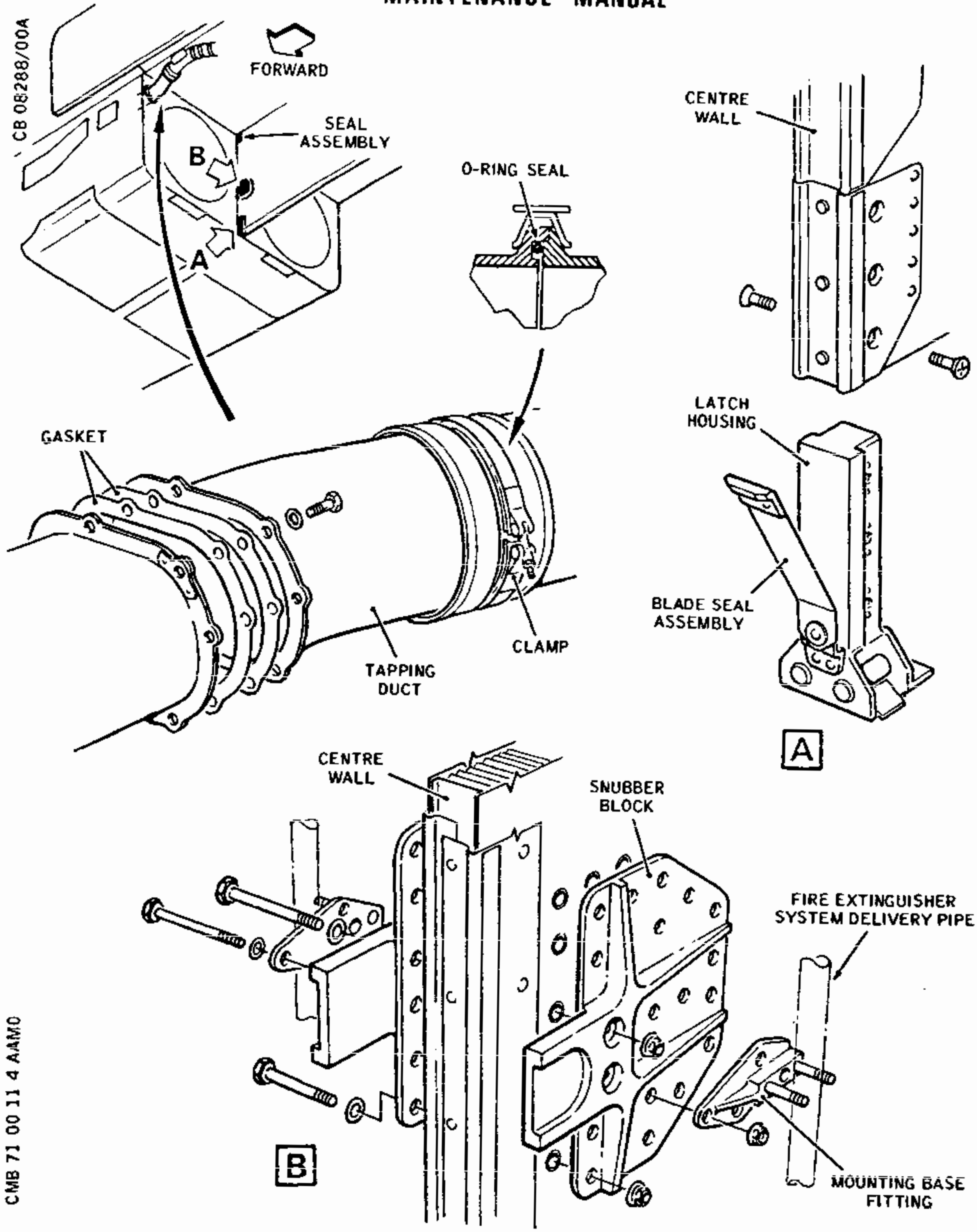
(9) Disconnect the air intake hydraulics (Ref. Fig. 403):

NOTE: The following is for the LH intakes. Disconnection of the RH intakes is similar, but for access panels GP read BP. The RH intake access panels are given in brackets.

When disconnecting pipe joints, be prepared to catch spilling hydraulic fluid in clean containers.

Blank all open pipe ends.

(a) Disconnect the GP flexible supply pipe at the coupling break point on engine 1 and disconnect the GP and YP flexible supply pipes at the coupling break point on engine 2 (Detail B and E).



Intake/Engine Joint Fittings
Figure 401

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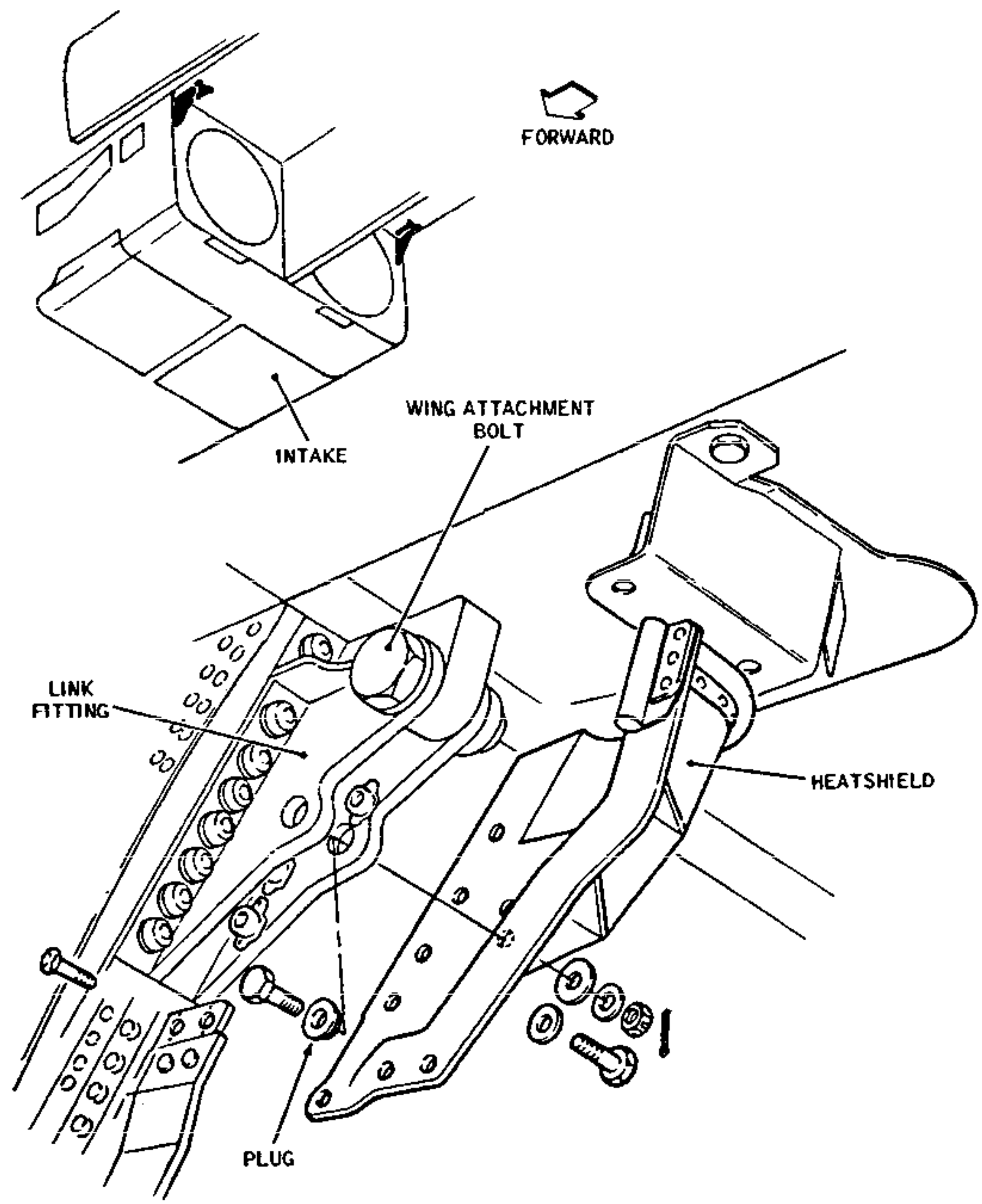

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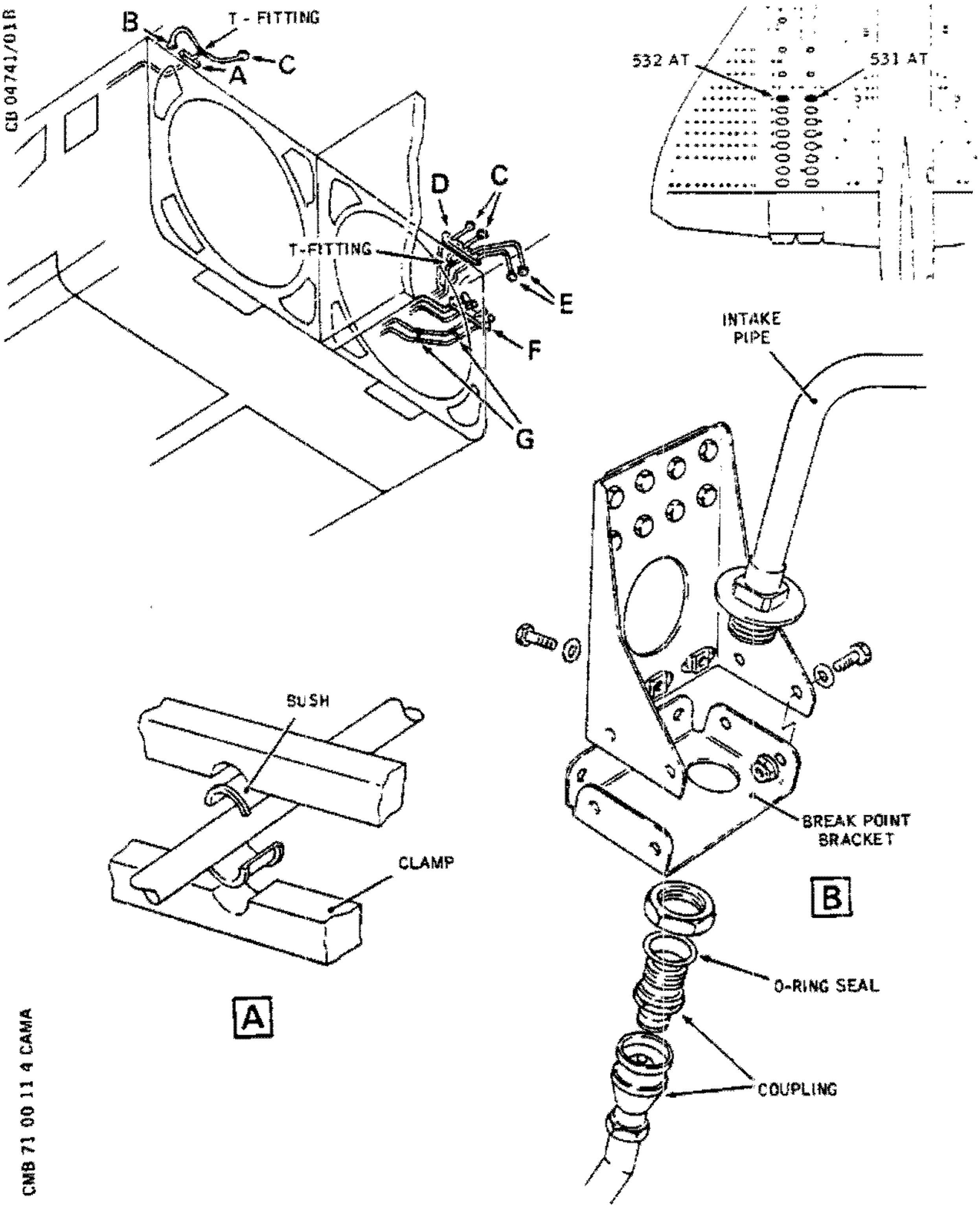
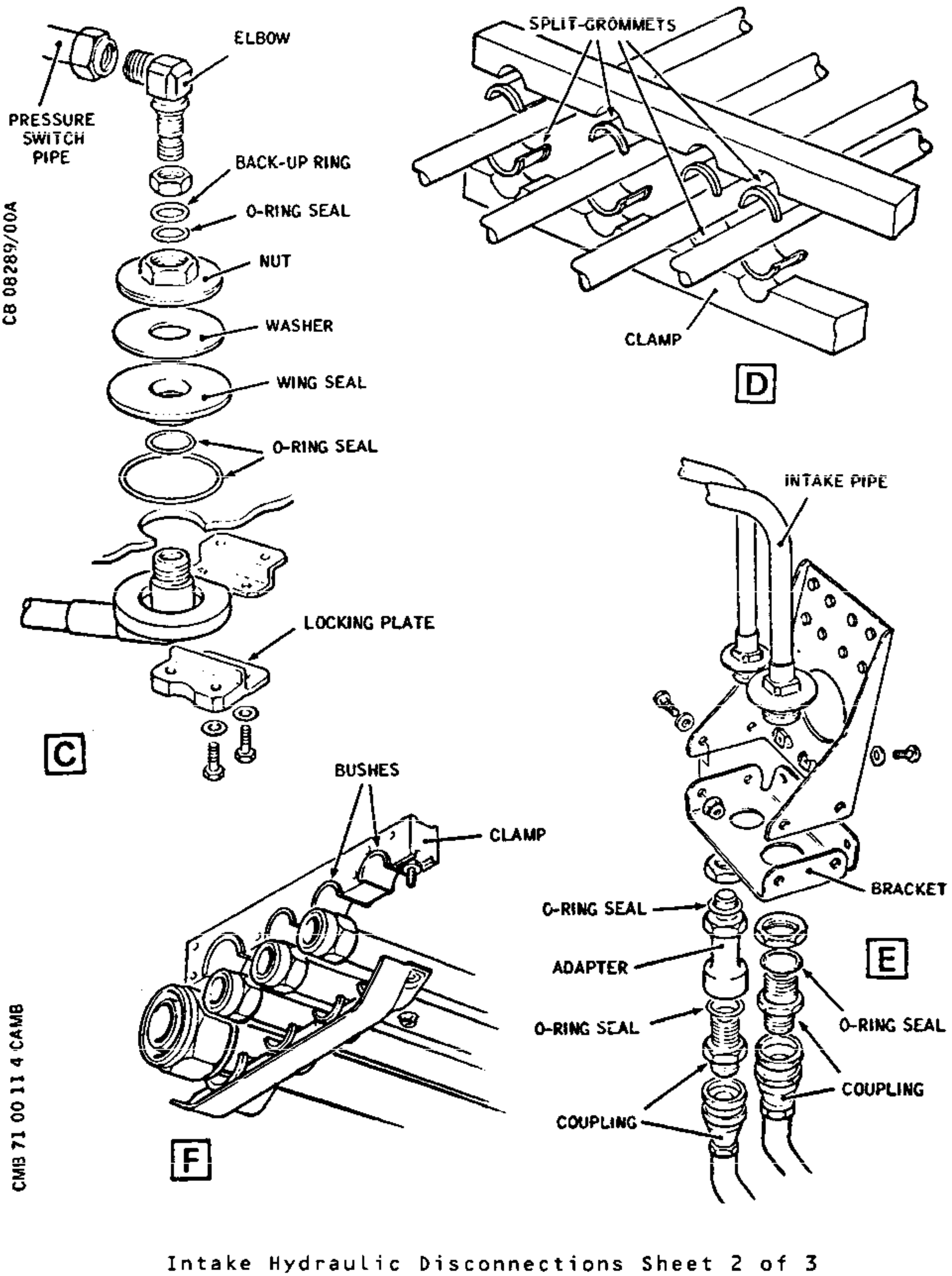
Heat Shields - Installation
Figure 402



Intake Hydraulic Disconnections Sheet 1 of 3
R Figure 403



Intake Hydraulic Disconnections Sheet 2 of 3
Figure 403

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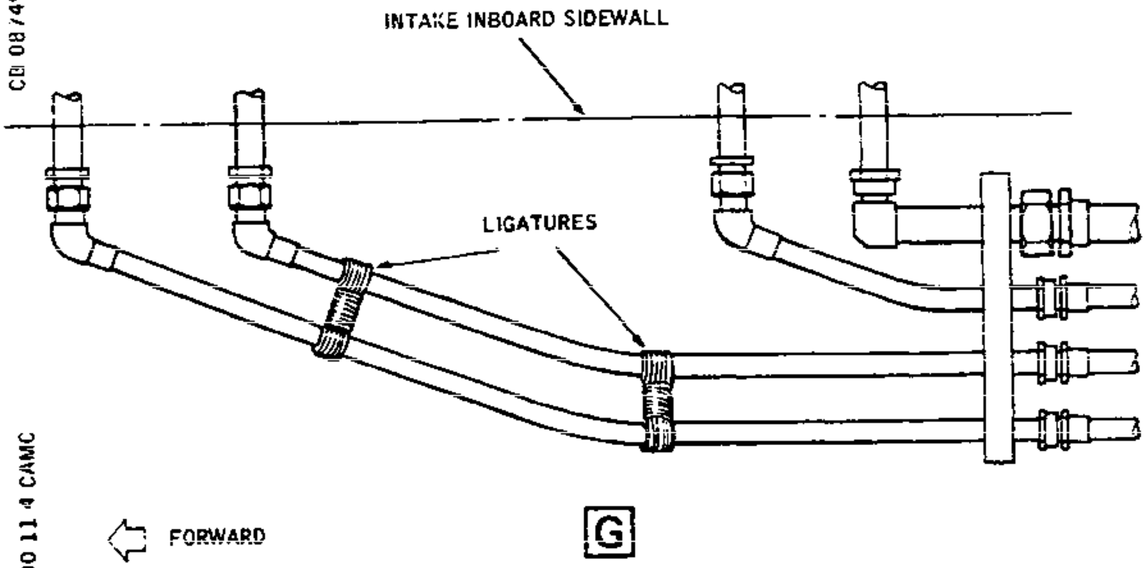

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Intake Hydraulic Disconnections Sheet 3 of 3
Figure 403

(b) Disconnect the intake pipes from the break point brackets on engines 1 and 2.

(c) Remove the break point brackets from engines 1 and 2.

(d) Remove access panel 531AT and 532AT (631AT and 632AT) in the wing upper surface to gain access to the dry bay and disconnect the pressure switch pipes from above and below the dry bay floor. Remove the bolts securing the pipe locking plate to the under-side of the wing (Detail C).

(e) Gain access to the hydraulic pipe clamps at the rear of the intake (Detail A and D). Remove the lower half of the wing clamp and split grommets.

R NOTE: These clamps are supplied as matched
R pairs and must be retained as such
R (Ref. 20-21-45).

(f) Open the fairing access panel 561 BB (661 BB),

disconnect the four hydraulic pipes, slide back the telescopic coupling and remove the bottom half of the adjacent pipe clamp. Remove and retain the clamp bushes (Detail F).

(10) Disconnect the electrical cables to the intakes (Ref. Fig. 404):

(a) Gain access to area above the ramps and disconnect the electrical loom connectors from the wing disconnect boxes.

(b) Disconnect the de-icing cables (running from the inboard intake disconnect box) at the inboard de-icing switch; untape the cables from the intake structure.

(11) Disconnect the forward ramps at the torque tubes:

CAUTION: DO NOT LOOSEN THE LINK LOCKNUT OR ALTER THE LENGTH OF THE LINK.

(a) Remove the split-pin nut and washer from each bolt securing the front ramp links to the torque tube levers.

(b) Support each ramp and remove the bolts; lower the ramp onto the support block.

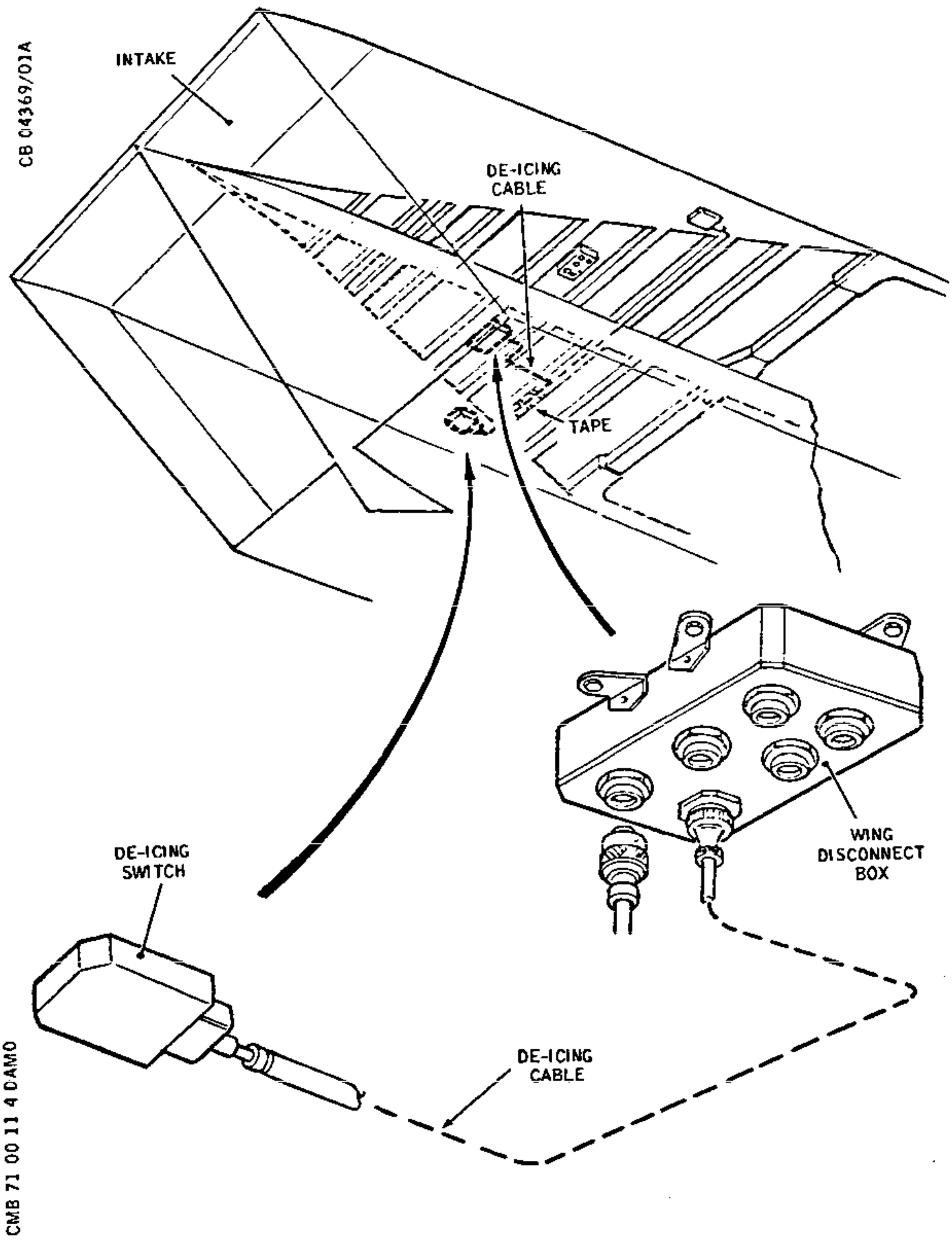
(12) Screw the ground equipment handle assembly into panel 421BZ, (431BZ); remove the panel. Disconnect the bonding lead from the intake forward centrewall position (spar 57) and from the rear centrewall position (spar 64) (Ref. Fig. 406).

NOTE: Panel securing bolts remain trapped beneath cover strip.

(13) Fit the ground equipment jacking pads to the intake (Ref. Fig. 405):

(a) Remove intake access panels 411MB and 421MB (LH) or 431MB and 441MB (RH) and fit the jacking pads to the access panel attachment points using the screws provided in the cradle toolbox.

(b) Remove four attachment screws from each access panel 411EB and 421EB (LH) or 431EB and 441EB (RH) and secure the forward jacking pads, utilizing the four screw holes, with the bolts provided. The pads are positioned centrally



Intake Electrical Disconnections
Figure 404

across the width of the panel with the arrow on the pad pointing forward.

(14) Bolt the cradle to the stand.

NOTE: If the cradle is fitted with castors and floor jacks, these will have to be removed before it can be fitted to the stand.

(15) Prepare the cradle (Ref. Fig. 405):

(a) Raise the top pallet 9 inches (229 mm) from its fully lowered position using the vertical travel handle at the front of the cradle. Check that the extension on all three jacks is the same. If adjustment is required on an individual jack, proceed as follows:

NOTE: To raise the top pallet the vertical travel handle must be rotated in the direction of the arrow.

(a1) Slacken the clutch for each of the remaining two jacks (Detail A).

(a2) Using the handle operate the out-of-phase jack to the correct height.

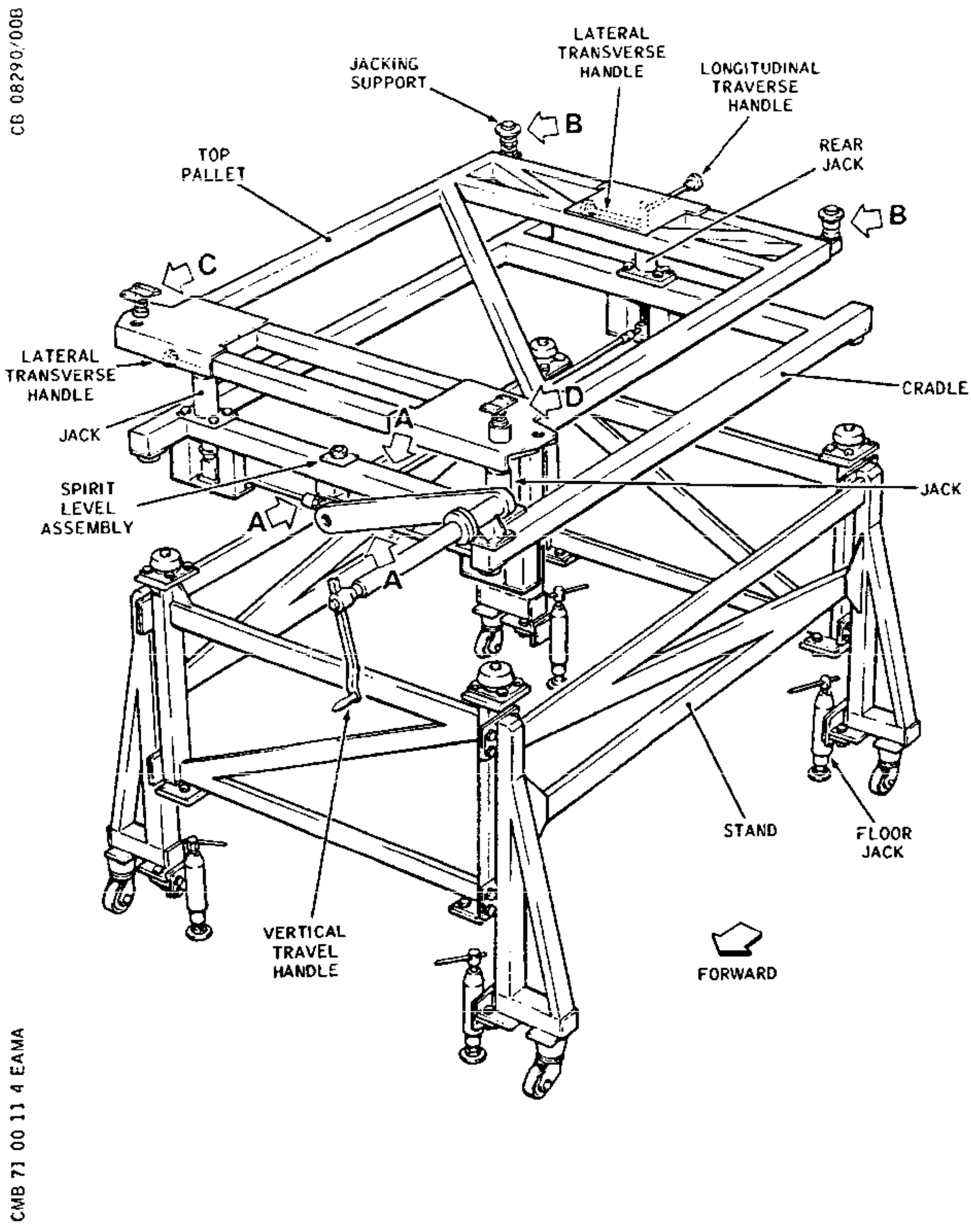
(a3) Re-engage the clutches of the other two jacks.

(b) Laterally centralize the top pallet using the lateral traverse handles.

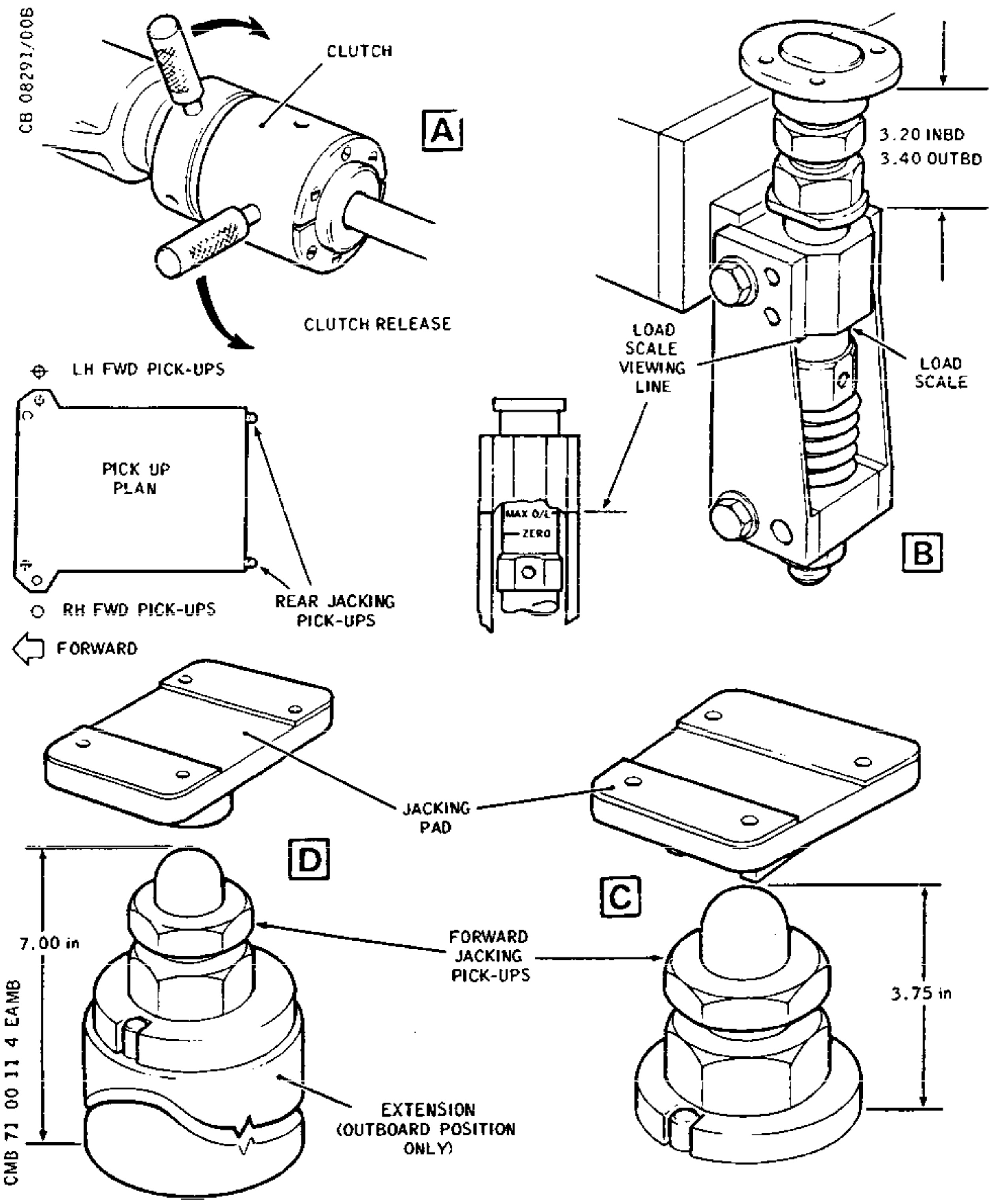
(c) Using the longitudinal traverse handle, move the top pallet fully aft then wind forward one inch (25.4 mm) (ten turns on the handle).

(d) Fit the jacking supports in the top pallet, ensuring that the forward pair are positioned in the appropriate holes for the LH or RH intake, and adjust them to the correct height (Details B,C and D).

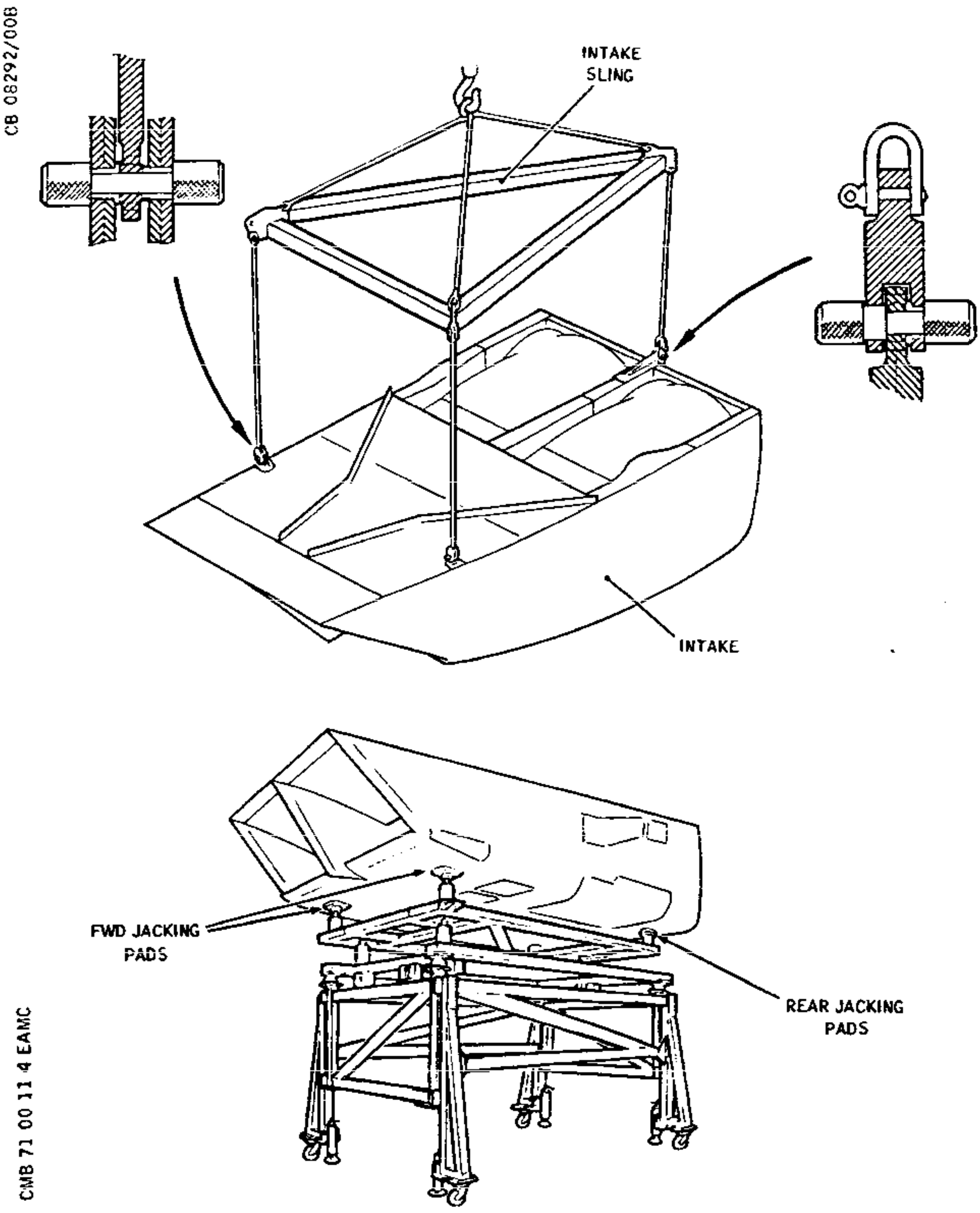
(16) Wheel the stand beneath the intake so that the jacking supports on the cradle align with the intake jacking pads. Raise the stand using the floor jacks until the castors are 0.50 in (12.7 mm) clear of the floor. Adjust the jacks until the stand is horizontal as shown by the spirit level, on the cradle.



Intake Ground Handling Equipment Sheet 1 of 3
R Figure 405



R Intake Ground Handling Equipment Sheet 2 of 3
Figure 405



R Intake Ground Handling Equipment Sheet 3 of 3
Figure 405

(17) Using the vertical travel handle raise the top pallet to bring the jacking supports into contact with the intake jacking pads. If necessary adjust the height of individual supports to obtain even contact with all four pads.

(18) Continue raising the top pallet until it is taking the weight of the intakes. Ensure that no overload condition is imposed on the intakes by observing the indication shown at the rear jacking supports (Ref. Fig. 405).

WARNING: WHEN MAX O/LOAD SHOWS ON SCALE (DETAIL B) THE SAFE LOAD LIMIT ON THE SUPPORT STRUCTURE FOR THE JACKING POINTS HAS BEEN REACHED, THEREFORE ALL FURTHER LIFTING MUST CEASE.

(19) Mark the position of the stand floor packs on the ground with crayon or chalk to facilitate repositioning of the stand when installing the intake.

(20) Remove the sleeve pin assemblies securing the intake to the links at the rear (spar 64) inner, and outer positions. Use the locating tool to facilitate the removal of each pin (Ref. Fig. 406). Remove the tool at completion of the operation.

(21) Gain access to the link at the forward (spar 57) centrewall position and remove the sleeve pin assembly. Use the locating tool to facilitate the removal of the sleeve pin (Ref. Fig. 406). Remove the tool at the completion of the operation.

(22) Remove the intake access panels 411 BL and 421 BR (LH) or 431 BL and 441 BR (RH) to gain access to the links at the forward (spar 57) inboard and outboard positions and remove the wing sleeve pin assembly (Ref. Fig. 406).

R (23) Remove, and retain, the sleeve pin and bolt fitted
R between the wing link assembly and the wing fitting
R at spar 59 (Ref. Fig. 406).

R NOTE: This pin is accessible through the inboard
R intake.

(24) Lower the forward end of the intake approximately one inch (25.4 mm) by disengaging the clutch for the rear jack on the cradle and using the vertical travel handle. Re-engage the clutch.

(25) Remove the sleeve pin assembly from the centrewall rear position (spar 64).

(26) Ensure that the rubber wing link seals are free from the intake.

(27) Lower the cradle, with all three jacks engaged, approximately 1.25 inches (31.75 mm) to bring the intake fitting on the centre wall at spar 64 just clear of the wing fitting bracket.

(28) Move the intake forward and downward by using the vertical and the longitudinal traverse handles simultaneously until the top of the intake centre wall is clear of the engine bay centre wall.

(29) Disengage the clutches for the two front jacks and lower the rear end of the intake until level. Re-engage the clutches.

(30) Continue lowering the intake until all the links are well clear of the intake top surface.

(31) Lower the stand on to its castors by retracting the floor jacks, then wheel the stand complete with cradle and intake clear of the aircraft.

(32) To remove an intake from the cradle using the sling (Ref. Fig. 405).

(a) Suspend the sling, using a suitable hoist having a safe working load 4500 lb (2041 kg), over the intake.

(b) Attach the sling to the intake with links, pins and nuts, taking care to fit each link to its specified position.

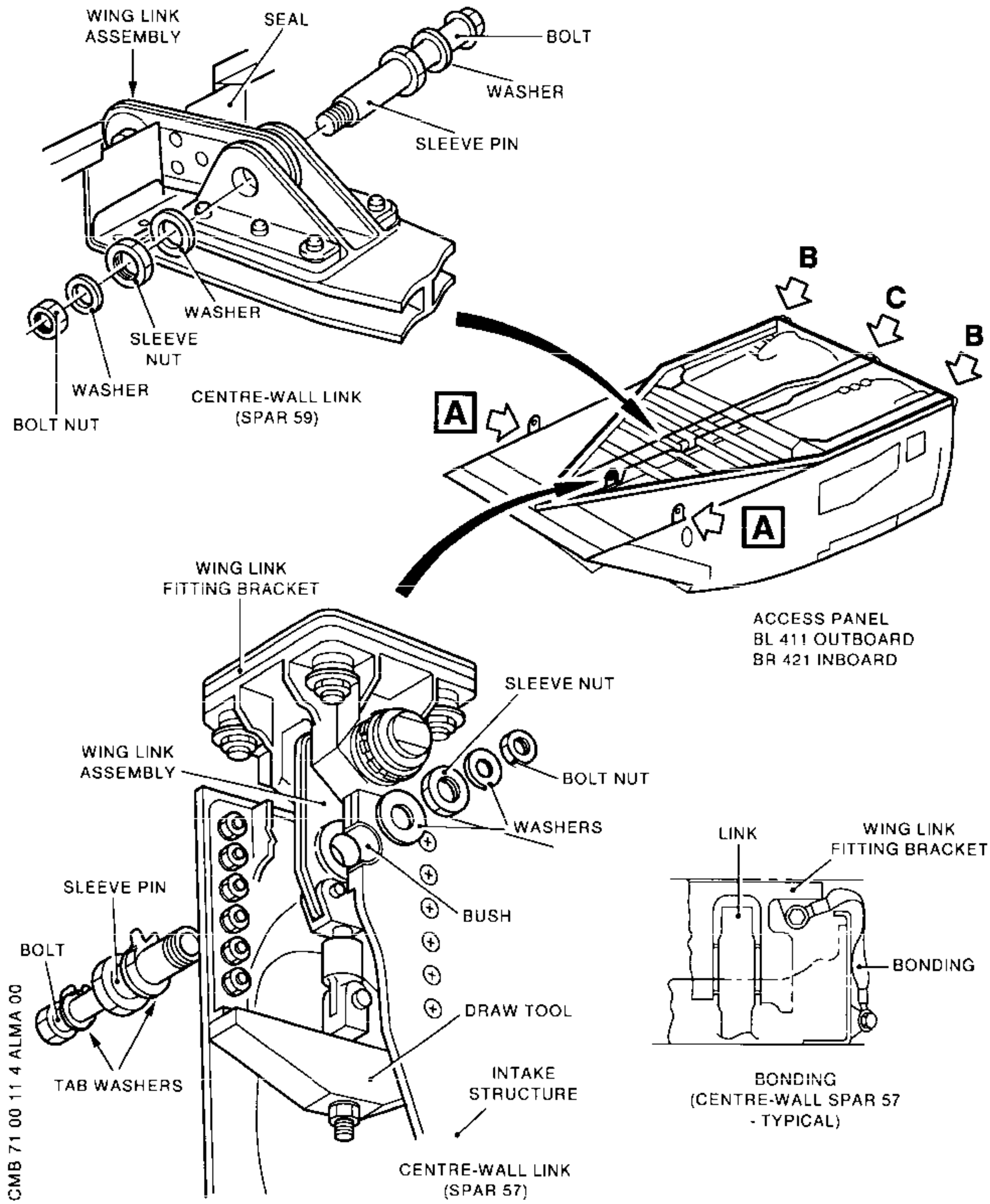
(c) Lift the intake from the cradle, lower it on to a suitable stand and detach the sling from the intake. Remove the slinging bushes.

(d) Remove the jacking pads from the intake and refit the access panels and bolts.

(33) Envelope the intake in a sheet of polythene or similar material to exclude dirt,debris and foreign matter.

D. Prepare to Install Intake.

NOTE: It is assumed that the intake is complete for installation and that any work necessary to repair



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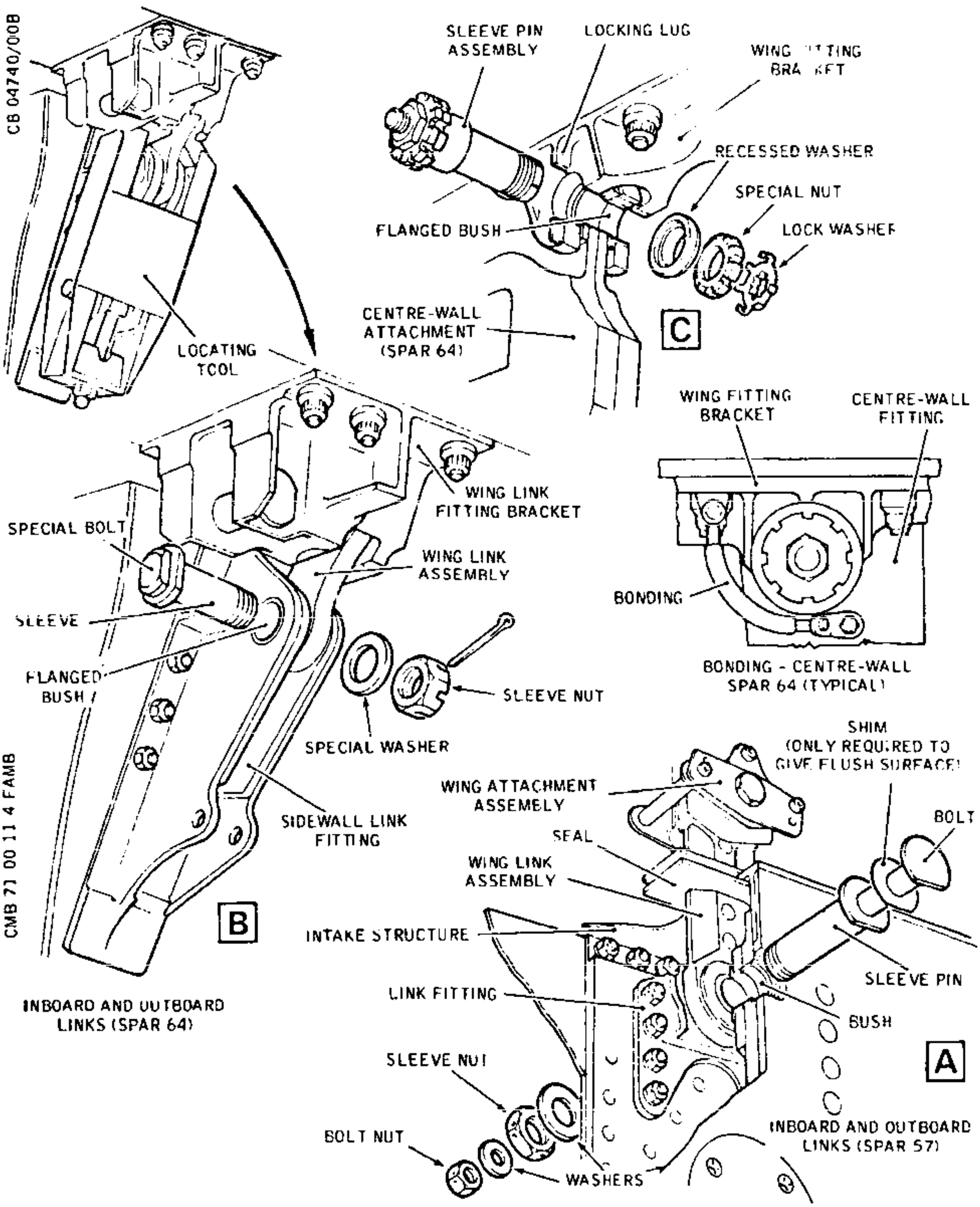
Intake Attachment Sheet 1 of 2
Figure 406



Intake Attachment Sheet 2 of 2
Figure 406

R

damage, corrosion and fuel leaks to the intake area has been completed in accordance with 28-11-00, Approved Repairs.

(1) Lift the intake onto the cradle using the sling (Ref. Fig. 405):

(a) Prepare the cradle stand in readiness to receive the intake, fit the jacking pads to the bottom of the intake and attach the sling (Ref. para. 2.C).

(b) Lift the intake onto the cradle locating the jacking supports in the jacking pads. If necessary, adjust the height of individual supports to obtain even contact with all four jacking pads.

(c) Remove the sling from the intake.

(2) Examine the bushes, previously used for sling attachments, for damage and, if necessary, refit new bushes in accordance with 20-26-33.

(3) Ensure that the forward ramps are still disconnected at the torque tubes and are resting on support blocks.

(4) Check the wing link assemblies for freedom of movement.

(5) Inspect the forward inboard and outboard wing link seals for deterioration. Fit new seals if necessary.

(6) Ensure that the main landing gear is still retracted and secured.

(7) Ensure that the safety precautions detailed for removal of the intake still apply.

(8) Carry out the following procedure to ensure the cleanliness of the intake prior to installation:

<u>NOTE</u>: Small items and debris such as bolts, nuts, washers, split-pins, rivets,rivet heads and rivet tails can cause extensive damage, if sucked into the engine compressor, necessitating the replacement of the engine. It is essential therefore, that stringent precautions and inspections be carried out at all times to ensure the cleanliness of the intakes during

installation.

(a) Cover the vent holes in the floor of the inner intake with an adhesive backed strip of material such as 'Fablon' to prevent the ingress of debris.

(b) Thoroughly inspect the entire area on the top of the intake, particularly between the wing seals (top surfaces of longeron) to ensure that it is free of dirt, debris and foreign matter (including tools).

(c) Inspect all structural ledges shelves and ridges to ensure that they harbour no foreign matter.

(9) Adjust the cradle (Ref. Fig. 405):

(a) Raise the top pallet 9 inches (229 mm) from its fully lowered position, using the vertical travel handle. Check that the extension on all three jacks is the same; if adjustment is required on an individual jack:

(a1) Slacken the clutches of the remaining two jacks.

(a2) Using the handle, operate the out-of-phase jack to the correct height.

(a3) Re-engage the clutches of the remaining two jacks.

(b) Laterally centralize the top pallet using the lateral traverse handle.

(c) Using the longitudinal traverse handle, move the top pallet fully forward, then wind aft for one inch (25.4 mm) (ten turns on the handle).

(10) Wheel the stand/cradle complete with intake beneath the wing aligning the floor jack feet with the locations previously chalked on the floor during removal. Raise the stand using the floor jacks until the castors are half an inch (12.7 mm) clear of the floor. Adjust the jacks until the stand is level as shown by the spirit level on the cradle.

E. Install Intake

(1) Position the intake to receive the pin at the rear centrewall position (Ref. Fig. 405):

(a) Raise the rear end of the intake approximately one inch (25.4 mm) by disengaging the front clutches and operating the vertical travel handle. On completion re-engage the clutches.

(b) Move the intake aft, using the longitudinal traverse handle, until the rear of the intake centrewall is as close as possible to the engine bay centrewall.

(c) Raise the intake in the nose down position, using the lifting handle until the upper end of the engine bay centrewall just enters the channel in the pin fitting on the intake centrewall. Guide the inboard and outboard links at the forward position (spar 57) into their slots in the intake boundary layer floor, using the lateral traverse handle, as necessary.

(d) Using the longitudinal traverse and the vertical travel handles simultaneously, move the intake upward and rearward until the top of the intake wall is approximately 1.5 inches (38.1 mm) from the top of the engine bay centrewall.

(e) Move the intake aft using the longitudinal traverse handle, until the hole in the intake centrewall link bracket is immediately below its mating hole in the wing bracket. Ensure no overload condition is imposed on the intake by observing the indication shown at the rear jacking support (Detail B).

<u>NOTE</u>: Ensure that the inboard and outboard links at spar 57 are guided into their brackets.

(2) Fit the bushes and split-grommets to the hydraulic pipes at the split-clamp positions at spar 64
R (Ref. Fig. 403) (Details A, D, and F).

After SB 71-046 For A/C 004-007,

(2) Fit the bushes to the hydraulic pipes at the split clamp position at spar 64 (Ref. Fig. 403) (Detail F).

(3) Connect the de-icing cable, running from the wing disconnect box, to the inboard de-icing switch ensuring that the connections are made in accordance with the cable identification and the applicable wiring diagram, then tape the de-icing cable to the intake structure cross beams as instructed in 20-27-15 (Ref. Fig. 404).

(4) Locate the seals on the wing links at the forward (spar 57) inboard and outboard positions, to the intake. Lubricate the seals with liquid soap and engage the seal groove with the structure.

(5) Fit the rear (spar 64) centrewall sleeve pin assembly (Ref. Fig. 406).

(a) Lift the intake approximately 1.25 in (31.75 mm), using the vertical travel handle.

NOTE: Ensure that the hydraulic pipes enter the holes in the wing.

(b) Spray the sleeve pin with molybdenum disulphide lubricant, then insert the sleeve pin assembly using the appropriate alignment tool.

(c) Secure the pin with the recessed washer and nut.
R Torque tighten the nut to between 796 and 929
R lbf in (9 and 10.5 mdaN) and fit the lockwasher.

(6) Lower the rear jacking supports clear of the intake jacking pads.

(7) Disengage the clutch for the cradle rear jack and, using the lifting handle, raise the forward end of the intake simultaneously guiding all links into position, until the holes in the wing links at the forward (spar 57) inboard and outboard positions are aligned with the holes in the intake brackets.

(8) Fit the locating tool to the forward (spar 57) centrewall link to assist alignment of the bearings (Ref. Fig. 405):

NOTE: The forward and intermediate centrewall attachments are accessible from the intake diffuser. Before entering the intake ensure

that the intake protective equipment is in place as instructed in the precautions prior to entering the intake (Ref. Para. 2.B.).

(9) Fit the sleeve pins and bolts to the intermediate, forward and rear positions using the locating tools and alignment pins to facilitate fitting in the following order (Ref. Fig. 406):

NOTE: Lubricate sleeve pins and bolts with 'Never Seez' grease.

(a) Fit the centrewall intermediate (spar 59) sleeve
R pin and bolt between the wing link assembly and
R the wing fitting (Ref. Fig. 406).

(b) Fit the forward (spar 57) inboard and outboard sleeve pins and bolts. If necessary, fit shim(s) beneath the bolt heads to bring them flush with the skin to a figure of +0.000 and -0.020 in (+0.000 and -0.508 mm).

(c) Fit the forward (spar 57) centrewall sleeve pin and bolt. Remove the locating tool.

(d) Fit the locating tools to the rear (spar 64) inboard and outboard sidewall links to assist alignment. Fit the rear sleeve pin assemblies using the locating tools and alignment pins as necessary.

NOTE: It is essential for clearance with the engine bay doors that these sleeve pins are fitted thus:

- Inboard pin - head inboard
- Outboard pin - head outboard.

(10) Remove the locating tools from the rear inboard and outboard link positions.

(11) Fit the nuts to the sleeve pins and bolts and torque tighten to the following values:

B NOTE: This is an ND task. The following steps
B require duplicate inspections of the locking
B features and thread extension.

R (a) Intermediate centrewall (spar 59) sleeve pin to
between 210 and 230 lbf in (2.37 and 2.60 mdaN)
and the bolt to between 145 and 160 lbf in

(1.636 and 1.81 mdaN). With locking wire, secure the sleeve pin head and nut to the locking tabs. Secure the bolt head and nut to the sleeve pin head and nut.

(b) Forward centrewall sleeve pin to between 500 and 550 lbf in (5.65 and 6.21 mdaN) and the bolt to between 400 and 425 lbf in (4.52 and 4.80 mdaN). Secure the sleeve pin nut to the locking tab with locking wire. Secure the bolt nut to the sleeve pin nut.

(c) Forward inboard and outboard sleeve pins to between 320 and 340 lbf in (3.62 and 3.84 mdaN) (Aircraft fitted with standard nuts 0.375 in (9.53 mm) thick - pre mod 9994/255 to between 400 and 425 lbf in (4.52 and 4.8 mdaN)). The bolts to between 140 and 160 lbf in (1.58 and 1.81 mdaN). Secure with locking wire, the sleeve pin nuts to their locking tabs and the bolt nuts to the sleeve pin nuts.

(d) Rear inboard and outboard sleeve pin to between 390 and 430 lbf in (4.41 and 4.86 mdaN). Secure the nut with a split pin.

NOTE: If a new pin assembly is fitted the split-pin hole position must be 'pipped', and the pin assembly removed from the aircraft for drilling (hole dia: 0.131 in (3.3 mm)).

R (12) Deleted.

(13) Position and secure the access panels:

NOTE: After installation remove the handle assembly from panel 421 BZ (431 BZ).

PANEL IDENT	FASTENER LBF IN	TORQUE LOAD mdaN
421 BZ (431 BZ)	30 - 35	0.339 - 0.395
411 BL (431 BL)	50 - 60	0.565 - 0.678
421 BR (441 BR)	50 - 60	0.565 - 0.678

(14) Lower the top pallet of the cradle well clear of the

intake and using the floor jacks, lower the stand on to its castors. Wheel the stand/cradle clear of the intake.

(15) Remove the jacking pads from the intake and refit the panel screws and the access panels removed prior to fitting the pads (Ref. Fig. 405).

(16) Connect the bonding leads at the forward and rear centrewall positions; torque tighten the nuts to between 30 and 40 lbf in (0.339 and 0.452 mdaN) (Ref. Fig. 406).

(17) Connect the intake electrical cable connectors to the wing disconnect box and wirelock (Ref. Fig. 404) (Ref.WDM 20-42-48).

(18) Connect the air intake hydraulics (Ref. Fig. 403):

NOTE: The following is written for the LH intakes.The connections for the RH intakes are similar but for GP read BP and the RH intake access panels are given in brackets.
Fit new O-ring seals where used at the connections.

(a) Connect the intake pipes to the wing pipes (Detail F):

(a1) Connect the intake pipes to the wing pipes at the hinged fairing panel 561BB (661BB) and torque tighten the coupling nut for the 1 in (25.4 mm) dia. pipe (GP) to between 450 and 500 lbf in. (5.08 and 5.65 mdaN) and the nuts for the remaining three pipes to between 400 and 560 lbf in. (4.52 and 6.33 mdaN).

(a2) Fit the lower half of the adjacent clamp together with the clamp bushes and torque load the clamp nuts to between 30 and 40 lbf in (0.339 and 0.452 mdaN).

(a3) Renew the ligatures (Ref. Fig. 403) in accordance with 20-23-14, ensuring that the pipes are not moved from their assembled position.

(a4) Encapsulate the ligatures with Viton sealant in accordance with 20-22-12.

(b) Fit the bottom half of the wing clamp at the rear of the intake; torque tighten clamp bolts to between 30 and 40 lbf in (0.339 and 0.452 mdaN)(Details A and D).

R NOTE: These clamps are supplied as matched
R pairs and must be retained as such
R (Ref. 20-21-45).

(c) Assemble the pipes to the bottom of the dry bay floor (Detail C):

(c1) Ensure that the joint surfaces of the pipe flange and wing surface are coated with Viton sealant (Ref. 20-22-12) and secure the pipe locking plate to the underwing bracket with bolts, washers and nuts, torque tightened to between 60 and 70 lbf in (0.678 and 0.791 mdaN).

(c2) Secure the pipe to the dry bay floor with the wing seal fitted with two new seals, washer and nut. Torque tighten the nut to between 695 and 705 lbf in (7.854 and 7.967 mdaN) and secure it with locking wire.

NOTE: The pipe must be secured by the locking plate before tightening the pipe nut.

(c3) Assemble the elbow fitting together with the nut seal and back-up ring to the pipe in the floor. Connect the pressure switch pipe to the elbow fitting. Torque tighten the nut and pipe coupling nut to between 95 and 115 lbf in (1.073 and 1.299 mdaN).

(d) Fit the break point bracket to the structure on engines 1 and 2 using bolts, washers and (where fitted) nuts. Torque tighten to between 40 and 45 lbf in (0.452 and 0.508 mdaN)(Detail B and E).

(e) Secure the intake pipes to the brackets with the nuts torque tightened to between 450 and 500 lbf in (5.08 and 5.65 mdaN). Fit the adaptor (on engine 2) together with a new O-ring seal, torque tightened to between 900 and 950 lbf in (10.17 and 10.735 mdaN).

NOTE: Pipes should fit in the bracket naturally and not be strained into position (Ref. 20-23-12).

(f) Connect the GP flexible supply pipe coupling on engine 1, and connect the GP and YP flexible supply pipes on engine 2, fitting a new O-ring seal at each connection. Torque tighten the couplings to between 950 and 1000 lbf in (10.735 and 11.30 mdaN).

(g) Check that the pipe tee-fittings (Ref. Fig. 403) have a minimum clearance with the wing under-surface as given in Table 401 by passing between them a slip-gauge equivalent to the desired clearance. Check that the clearance between the remaining intake hydraulic piping and wing under-surface is as stipulated in 20-23-12.

R

ENGINE BAY	TEE-FITTING CLEARANCE
1	0.08 in (2.03 mm)
2	0.15 in (3.81 mm)
3	0.15 in (3.81 mm)
4	0.08 in (2.03 mm)

Hydraulic Pipe Tee-fitting Clearances
Table 401

(19) Fit the heat shield supports to their position adjacent the rear inboard and outboard wing link brackets using bolts and nuts, and bolts in anchor nuts. Torque tighten to between 30 and 40 lbf in (0.339 and 0.452 mdaN).

(20) Fit the seal assembly to the top of the forward edge of the engine centrewall. (Ref. 54-21-27. Removal/ Installation).

(21) Fit the heatshields:

(a) Fit the heatshields to the intake rear inboard and outboard link fittings and secure them with bolts and washers torque tightened to between 40 and 45 lbf in (0.452 and 0.508 mdaN).Fit the plug and secure it with the bolt and nut torque tight-ened to between 30 and 40 lbf in (0.339 and 0.452

mdaN). Secure the nut with a split pin.

(b) Fit the underwing firewall panel No. 1 (Ref.71-32-11, Removal/Installation).

(c) Fit the cornice heatshield at the top of the engine bay centrewall where it abuts the intake (Ref. 71-32-13, Removal/Installation).

(d) Fit the hydraulic pipe shrouds:

(d1) Place the split sleeve and Minax clip in position on the hydraulic pipe. Do not tighten the clip.

(d2) Assemble the two halves of the cup heat-shield round the sleeve and secure with the three screws and nuts. Do not tighten.

(d3) Centre the assembled heatshield on the pipe and secure to the roof attachment with the screws. Torque tighten the screws to 15-20 lbf in. (0.169 - 0.226 mdaN).

(d4) Torque tighten the screws joining the two halves of the heatshield to 31-40 lbf in. (0.35 - 0.45 mdaN).

(d5) Tighten the Minax clip. Wirelock the securing screws and Minax clip (Ref. 20-21-13).

(22) Fit the tapping duct of the air conditioning system (Ref. Fig. 401).

(a) Secure the forward end of the duct to the engine tapping with two gaskets bonded together (Ref. 20-22-21) interposed between the two faces, using bolts and washers. Torque tighten the bolts to between 30 and 40 lbf in (0.339 and 0.452 mdaN).

(b) Secure the rear end of the duct, together with a new O-ring seal, to the adjoining duct with a pipe clamp. Torque tighten the clamp nut to between 45 and 50 lbf in (0.508 and 0.565 mdaN).

(23) Fit the latch housing to the front of the engine bay centrewall. Torque tighten the six attachment bolts to between 40 and 45 lbf in (0.452 and 0.508 mdaN) (Ref. Fig. 401).

(24) Assemble the snubber blocks, together with the mounting base fittings that support the fire extinguisher system delivery pipes, to the front of the engine bay centrewall. Torque tighten the 0.25 in (6.35 mm) dia bolts to between 60 and 70 lbf in (0.678 and 0.791 mdaN) and the 0.190 in (4.826 mm) dia bolts to between 30 and 40 lbf in (0.339 and 0.452 mdaN).Fit the three longest, 0.190 in (4.826 mm) dia, bolts where the mounting base fittings are secured to the blocks (Ref. Fig. 401).

(25) Fit the forward and aft transition rings (Ref. 71-21-11, Removal/Installation).

(26) Connect the forward ramps at the torque tubes by raising the ramp, positioning the links in the torque tube levers and fitting the bolts washers and nuts. Torque tighten the nuts to between 220 and 350 lbf in (2.49 and 3.95 mdaN) and fit split-pins around the
R castellated nuts. Encapsulate the head and legs of
R the split pins with sealant in accordance with
R 20-22-19.

(27) Carry out a thorough inspection of the intake to ensure that it is clean and entirely free of debris and foreign matter (Ref. 54-00-00, Inspection/Check):

(a) Inspect the area behind the bottom secondary air doors for debris that may have fallen to the bottom of the cascades from the top of the secondary air ducts.

(b) Remove the intake access panels 411 and 421KB, JB,HB(LH);431 and 441 KB,JB,HB(RH) and inspect the cavity beneath the dump door hinge for items that may have been trodden forcibly past the hinge seal on the floor of the intake.

(c) Inspect the areas behind access panels removed in this and previous operations and then replace all access panels.

(d) Remove all tools and ground equipment.

(28) Release and lower the main landing gear to the fully down position. If the gear was only partially raised set the L/GEAR normal control lever to "DOWN" to agree with the position of the landing gear. Fit the safety locking pins.

(29) Lower the aircraft to the ground (Ref. 7-11-00).

(30) Reset the circuit breakers previously tripped including those tripped as part of the precautionary procedure prior to entering the intakes (as given in 71-00-00, Servicing).

(31) Make available ground electrical power (Ref. 24-41-00)

(32) Replenish the green and the yellow hydraulic reservoirs (Ref. 12-12-29).

(33) Carry out the following test procedure:

(a) Test the ramp and spill doors and check for hydraulic leakage.

(a1) Test the associated ramp and spill doors by carrying out the 'Preliminary Test - In Conjunction with One Ground Hydraulic Supply and Two Aircraft Ground Hydraulic Check-out Pumps as instructed in the Operational Test (Excluding Ramps Manual Inching Spill Doors Manual Inching and
R Auxiliary Inlets) (Ref. 71-61-00, Adjustment/Test).

(a2) Carry out the precautionary procedures necessary prior to entering the air intakes (Ref. 71-00-00, Servicing) and inspect the intake hydraulics for leakage

(a3) Rectify the cause of any hydraulic leakage found and then carry out the exit procedure from the intakes (Ref. 71-00-00,Servicing).

(b) Operationally test the secondary air doors (Ref. 71-31-00, Adjustment/Test).

(c) Test the installation of the intake by running the associated engine:

(c1) Observe the safety precautions detailed in 71-00-00, Adjustment/Test.

(c2) Test the LH or RH intake de-icing, as appropriate by carrying out an Operational Test detailed in 30-11-00, Adjustment/Test.

(c3) Test the T1 probe heater electrical circuit by confirming that the appropriate T1 failure warning light on the pilot's roof

panel 4-211 is illuminated.

(c4) Carry out the engine start procedure on any one of the two engines associated with the replacement intake (Ref. 71-00-00, Adjustment/Test). Check that the T1 failure warning light is extinguished.

(c5) With the engine operating at idling speed carry out Operational Test - Ramps Manual Inching and Spill Doors Manual Inching (Ref. 71-61-00, Adjustment/Test).

(c6) Operate the throttles to accelerate the engine speed to 95 per cent N2, as shown on the engine speed indicators on the pilot's centre panel, and hold for 30 seconds; return the throttle lever to the engine idling position and allow the engine speed to stabilize.

(c7) Shut-down the engine as instructed in the procedure given for Engine Shut-down in 71-00-00, Adjustment/Test.

(c8) Repeat operations (c1) to (c7) inclusive for the adjoining engine.

(d) Check for evidence of hydraulic leakage at the intake secondary air ducts, at all pipe joints which have been disturbed and around the engine.

(e) Carry out a visual external examination of the nacelles and intakes.

(f) Visually examine the engine compressor face for possible foreign object damage (Ref. 71-00-00, Inspection/Check).

3. BA Special Instructions for the Removal/Installation of Engine Bay Doors and Air Intakes

A. General

(1) Before removing air intakes the engine bay doors are to be removed to minimise the possibility of injury to personnel and damage to the doors.

(2) Special handling equipment is available to accomplish this operation.

B. Remove Engine Bay Doors

(1) Mount the two forward door handling fixtures on one scissors lift utilising the two special spreader beams.

(2) Fit pneumatic lines between air connections of door jigs and scissors lift micro-switch air connections.

(3) Mount the air intake handling cradle on the second scissors lift.

(4) Fit pneumatic lines between air connections of door jigs and scissors lift micro-switch air connections.

(5) Jack the aircraft in accordance with existing Maintenance Manual instructions (Ref. Chapter 7).

(6) Open forward engine bay doors and disconnect all services including firewires in accordance with instructions already in the Maintenance Manual.

(7) Close engine bay doors and position door handling equipment underneath.

(8) Lower scissors lift 'stepfast' floor jacks.

(9) Raise scissors lift by means of its inbuilt hydro-pneumatic power pack until the cradle pads are within approximately 6" of the engine bay doors.

(10) Remove door cradle bottom edge stops (three each).

(11) Raise the individual cradles by means of the hand wheel situated in the centre of one end until the pads are close to contacting the door contours.

(12) Adjust tilting mechanism by means of hand wheel on the outboard side to align as closely as possible parallel to the side door.

(13) Rotate the hand wheel on one end adjacent to the centre of the two doors to move handling structure inboard until the side pads nearly contact the side door skin.

(14) Adjust all the individual pads until in contact with the door contours both side and bottom.

(15) Repeat the above procedure (11) and (14) for the other door if not done simultaneously by other

personnel.

(16) Remove door hinge pins (both sides) in accordance with Maintenance Manual instructions, existing.

(17) Unfasten doors.

(18) Fit cradle edge stops to bottom of doors.

(19) Lower one door by means of mechanism jack only (central hand wheel at end of each cradle) for approximately 2".

(20) Lower the other door in similar manner.

(21) Operate tilt mechanism by means of hand wheel on outboard side until bottom edge of door is restored to its original position (i.e. 2" up again). This will cause the hinge points to move outboard and provide clearance when lowering the whole assembly to pass the engine and components.

(22) Repeat previous item for the other door.

(23) Each door assembly should now be lowered further by means of the screw jack (central hand wheel at end of each cradle) to its full extent (this will close the micro-switches and allow hydraulic operation to take place).

(24) After both doors have been lowered to the full extent on the screw jacks, operate the scissors lift table control and lower the whole assembly fully.

(25) Close main air inlet valve on scissors lift hose (this dissipates residual pressure), and disconnect shop line.

(26) Raise the floor jacks of the scissors lift and wheel the whole assembly clear of the aircraft (towards the rear of the aircraft.

C. Remove Intake

(1) Mount the intake top frame on scissors lift, utilising the main lifting sling and wire ropes from inboard pick-up points.

(2) Locate and clamp in position with location pins provided.

(3) With engine bay doors removed, position top frame and scissors under intake. Centralise fore and aft crosslide before positioning. Longitudinal screw adjuster to be within 1" of full rear adjustment. Use items 6 from BA drg. No: 0-54-1512-1BA.

(4) Lower scissors lift 'stepfast' floor jacks.

(5) Raise scissors lift by means of its inbuilt hydro-pneumatic power pack until the scissors stop.

(6) Fit the safety bars provided (if considered necessary).

(7) Fit the top frame jack pads to the intake (as laid out in Maintenance Manual).

(8) Raise the top frame into position by means of hand wheel provided.

Adjust for final position by means of other hand wheels (these hand wheels are fitted with a hexagon for the use of a ratchet drive as required).

(9) Release intake in accordance with existing Maintenance Manual instructions.

(10) Lower top frame vertically to lowest position, to engage pneumatic microswitch, by means of hand wheel.

(11) Lower scissors, by DOWN button.

(12) Mark floor position of scissors lift wheels and for 'stepfast' jacks for repositioning.

(13) Raise scissors lift 'stepfast' floor jacks.

(14) Fit strapping to top frame, securing the intake.

(15) Push scissors clear of aircraft - out past the trailing edge.

D. Remove Intake from Top Frame

To remove the intake from the top frame, use the equipment with a replacement intake, the following items of equipment are required.

Triangular sling	-	0-54-1511-1BA
Tripod Stand	-	GB1100/44
Adaptor 3"	-	GB1100/46

Adaptor 6" - GB1100/47
Jack pads (if considered necessary).

(1) To position scissors with intake before re-fitting ensure that longitudinal screw adjuster is within 1" of full forward adjustment.

(2) On fitting of intake into position, using aircraft hinge pins, jacks - item and probe - item 10 must be used. These may be found in box - item 19 of drawing 0-54-1512-1BA.

(3) Attach the triangular sling at its three (3) lifting positions - two (2) forward, one (1) rear - ensuring the sling is handed correctly (outboard forward wire will be shorter in length than the forward inboard). Final adjustement will be made by use of turnbuckles for true lift.

(4) Support weight of intake.

(5) Remove securing strapping from intake.

(6) Position four tripods in area where intake is to rest.

(7) Lift intake into position on tripods, utilising distance pieces at forward end from kit. If jack pads are fixed to intake the kit of jack pads will not be required with the tripods. The jack pads from this kit may be used to replace those taken from the top frame fit.

(8) Detach triangular sling.

E. To Remove Intake and Top Frame From Scissors Lift

Use the following items of equipment.

Main sling - 0-54-1510-1BA
Forward and rear beams - 0-54-1510-4BA

(1) Attach forward beam to top frame. This beam is 6" square and is attached by pins through 2 'U' channels. The rear beam is made from two 'U' channels back to back with strategically located distance pieces. The beam is attached to the top frame by pins through the two top frame eyebolts.

(2) Attach the main sling to the lifting eyes on the beams. The main lifting sling wire ropes should be positioned at alternate inboard and outboard

positions at the front, (i.e. inboard on one side, outboard on the other side).

(3) Disconnect the pneumatic lines between the top frame and scissors.

(4) Release two (2) off locating pins, which connect the top frame to the scissors lift table.

(5) Lift the top frame c/w intake from the scissors lift table.

(6) Set the top frame on its own wheels on the floor.

ENSURE THAT STRAPPING IS SECURE BEFORE RELEASING SLING OR TOWING ASSEMBLY.

F. To Tow Top Frame C/W Intake

(1) Release towbar from underneath top frame release two (2) pip pins and unhook from opposite side.

(2) Fit towbar with the 'pip' pins in brackets provided.

(3) Tow at maximum speed of 4 MPH (6 km/hr).

END OF THIS SECTION

NEXT

ENGINE HOIST - DESCRIPTION/OPERATION

1. SABENA ENGINE HOIST

The engine hoist 5-81659 is basically composed of the following sub-assemblies:

A. An assembly of 2 hinged beams enclosing a Ballscrew, lifting cables, electromagnetic brake, mechanical brake and 15/1 speed reducer.

B. A set of 3 hydraulic hoses with hydraulic motor - length $\pm$ 15 metres with 1 hydraulic motor ARZ - M16.

C. A set of 2 cables and plug assembly for connection between control pendant and main electrical box for junction box to main electrical box.

D. A trolley for hydraulic pack and electrical box, comprising:

(1) Hydraulic pack Bosch type HY/EP powered 24 Volts DC.

(2) Hydraulic manifold equipped with:

(a) 1 solenoid valve UP - DOWN
(b) 1 solenoid valve SLOW - FAST
(c) 1 flow regulator
(d) 1 relief valve set 25% above working pressure. (fast up operation)
(e) 1 pressure switch 10 to 12 Bar
(f) 1 pressure gauge 0 to 100 Bar

(3) Main electrical box.

E. Two Fairleads.

F. A box with 2 dial indicators and support (emergency kit). Ratchet wrench with 1/2 in. square drive and special clips for electrical brake release.

2. SAFETY SPECIFICATION

A. Classification - mobile and specialized loading equipment.

B. Max. load - Front 1850 Kgp
- Rear 2600 Kgp

C. Normal load - Front 1308 Kgp
- Rear 1850 Kgp

D. Test loads - 140% static,
- 125% dynamic

E. Periodical re-check: 12 months.

Ministry of Public Works = Belgium
Arrete Royal 26-02-57
Article 281

F. Official Agency: Association Vincotte

G. Protection against overloading of hoist:

Electronic safety: at 125% (± 2%)
Fault red light ON and hoist stops.
Hydraulic safety - relief valve on hydraulic circuit should limit load to 140 to 150%.

H. Safety coefficient for cable: 5

I. Braking of the load:

Dropping of load is avoided by electrical brake,
mechanical brake,
hydraulic lock of
hydraulic circuit.

WARNING: INFORM PERSONNEL WHEN USING THE EMERGENCy PROCEDURE WITHOUT HYDRAULIC POWER - AND AFTER ELECTROMAGNETIC BRAKE HAS BEEN RELEASED (BY USING SPECIAL RELEASING CLIPS) YOU RELY ON ONLY ONE BRAKE WHICH IS THE MECHANICAL BRAKE.

TAMPERING WITH THE RETAINING RATCHET WOULD UNAVOIDABLY CAUSE THE ENGINE TO DROP.

R B 3. COMPONENTS

A. Electrical power supply:

Use 115 - 208V.AC. 400 Hz from GPU.
Plug and receptacle 6 poles AN3114 - 1B.
Current draw: 12 Amps AC minimum.
Protection by 16 Amps breakers.

B. Hydraulic fluid:

Use straight mineral base oil.

Aeroshell fluid No.4 or equivalent.
Viscosity: 1.5°E at 50°C.
Flow: 10 litres/minute at 50 to 60 Bar.

C. Electromagnetic holding brake:

Warner FB/650.
Permanent Magnet type.
Liberated by demagnetising current.
Power supply: 35 to 75 Volts DC.
Torque capacity: min. 120% of nominal torque.

NOTE: Demagnetising current should be measured and supply voltage has to be trimmed for each unit by applying voltage until brake is loose. Install resistor to obtain adequate DC voltage at brake terminals.

D. Mechanical brake:

R B Ferrodo lining, loaded by Bellville washer stack adjustment
R B through nut and lock nut. Torque adjustment, 140% of load.

E. Worm and screw speed reducer:

Type ESCO VF 62/FC.
R B Ratio 15: 1.

F. Lifting speed: (approximate)

Fast: 200 to 300 mm/Minute.
Slow: 80 mm/minute (flow regulator position 3 to 4).

G. MAIN ELECTRICAL BOX;

(1) Warning lights.

R B (a) Red-hydraulic pressure: illuminates when hydraulic
R B pressure is low.
R B (b) Green-magn. brake: illuminates when electro-
R B magnetic brake is released.
R B (c) Yellow-fast speed: illuminates when high speed is
R B selected.

R B (2) Circuit breakers

16 Amps - main power protection for hydraulic pack.
1.6 Amps - protection of electronics and electrical controls.

NOTE: During road transportation, it may happen that

breakers spring open. Check for correct condition before operation.

(3) Zeroing load cells indications on the digital displays:

- With no load on cables, power ON. Trim on 2 potentiometers marked '0' to read zero on the display.

(4) Adjusting load cells for 100% indications on the displays.

With no load on cables - depress 100% FWD or AFT buttons in turn and trim on 2 potentiometers marked 100% to read 100 on the displays.

Electronic load control system is designed to detect all jamming and to stop the engine motion during the up or down operation of hoist.

Because of unavoidable mechanical frictions, the load indicated Figure may differ by a few % from the true value during the movement.

The test switch marked 100% is designed to check the correct functioning of the electronic circuit, but does not constitute an absolute reference.

H. CONTROL PENDANT

Looking from top to bottom.

(1) -Stop switch: cuts off ground power unit relay.

(2) -Reset switch:

Arms the system when power is applied, and allows a return to normal working after a fault condition has occurred.

(3) -Fault red light on: indicates:

(a) overload of 125%.
(b) load disparity: of 20%.

(4) Load

Give in percent of nominal load the forces acting on each cable.

(5) Engine up and down.

Use SLOW or FAST switches as required.

R B NOTE: Fault red light - illuminates, depress reset before operating further UP or DOWN switch.

I. ELECTRONIC LOAD CONTROL

This system consists of the following:

- 2 measuring devices which weigh the load applied on each of the lifting cables with a digital read out in percent of the normal loads. These loads are 1309 kg on forward cable and 1850 kg on rear cable.
- An interdiction device (load control) which stops the hoist operation for a difference of 20% between the observed values of the loads or in excess of 125%.

R B 4. OPERATION OF HOIST

R B A. Using the special sling install hoist on wing.(Fig.404)

R B B. Position spigot locators D937720000 in wing and insert spigots.(Fig.406)

C. Adjust FWD leg half way.

D. Connections:

(1) Install hydraulic motor and hose assy. to engine hoist.

(2) Connect 3 hoses to hydraulic pack.

(3) Connect electrical cable junction box on hoist to main electrical box.

(4) Connect electrical cable from main electrical box to control pendant.

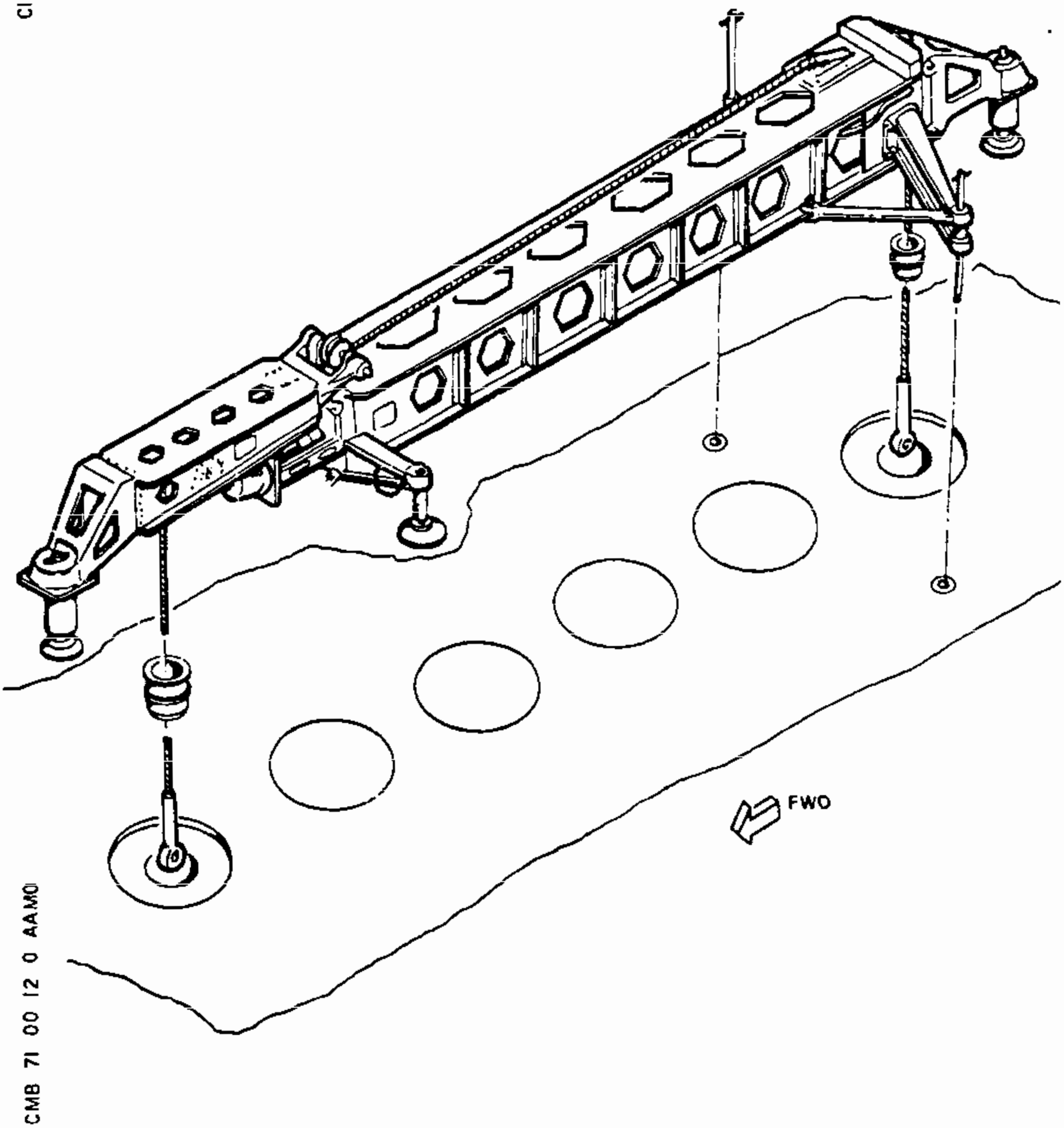
(5) Connect AN3114 connector of GPU 115-208 V.AC 400 Hz (12 Amps min) to main electrical box.

(6) Replace oil tank plug for air vent dip-stick before starting hydraulic pack unit.

CAUTION: IN ORDER TO AVOID DAMAGING THE PLUG PINS, BE EXTREMELY CAREFUL WHEN INSERTING THE ELECTRICAL PLUG.

E. Power ON:

CIC 0016/00A

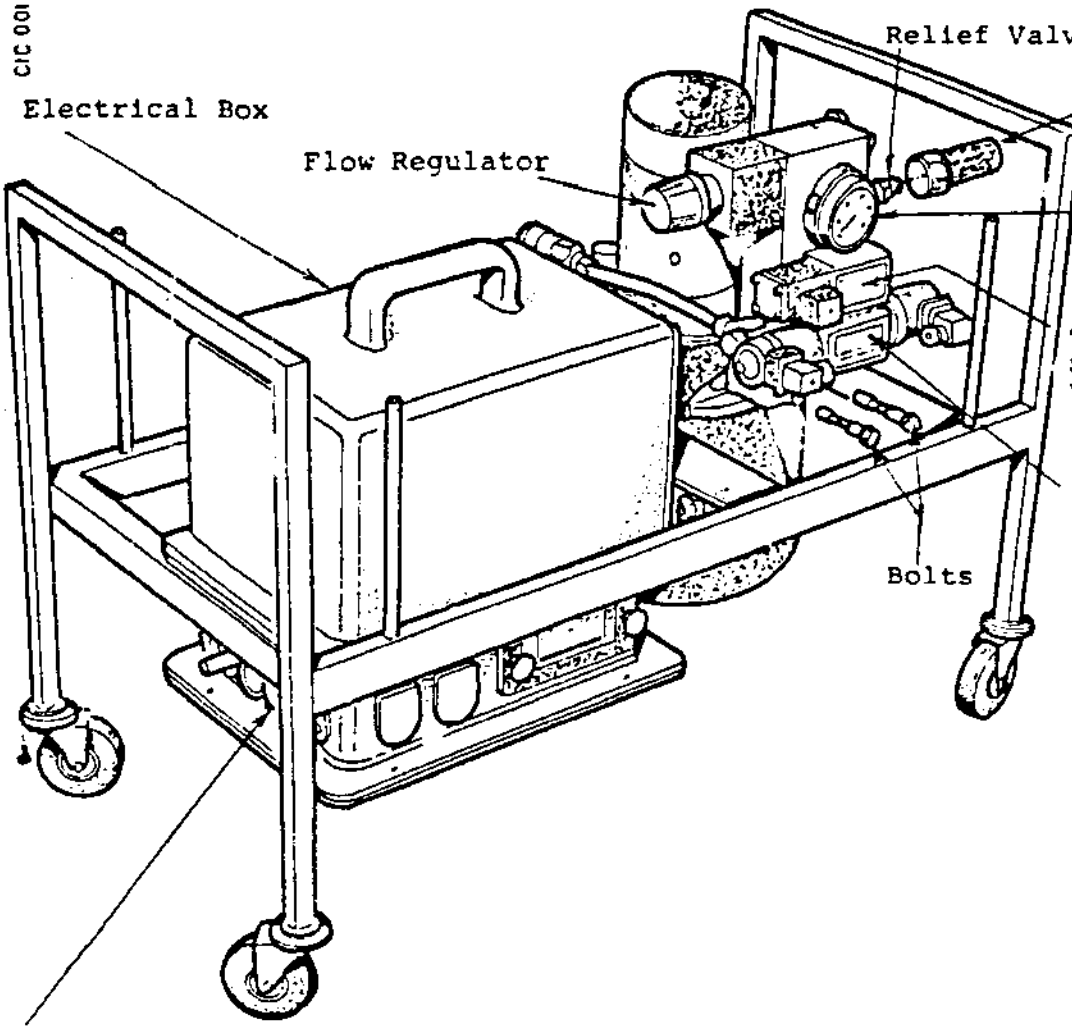


CMB 71 00 12 0 AAM01

Sabena Olympus Engine Hoist
Figure 001

B

CIC 0017/00A



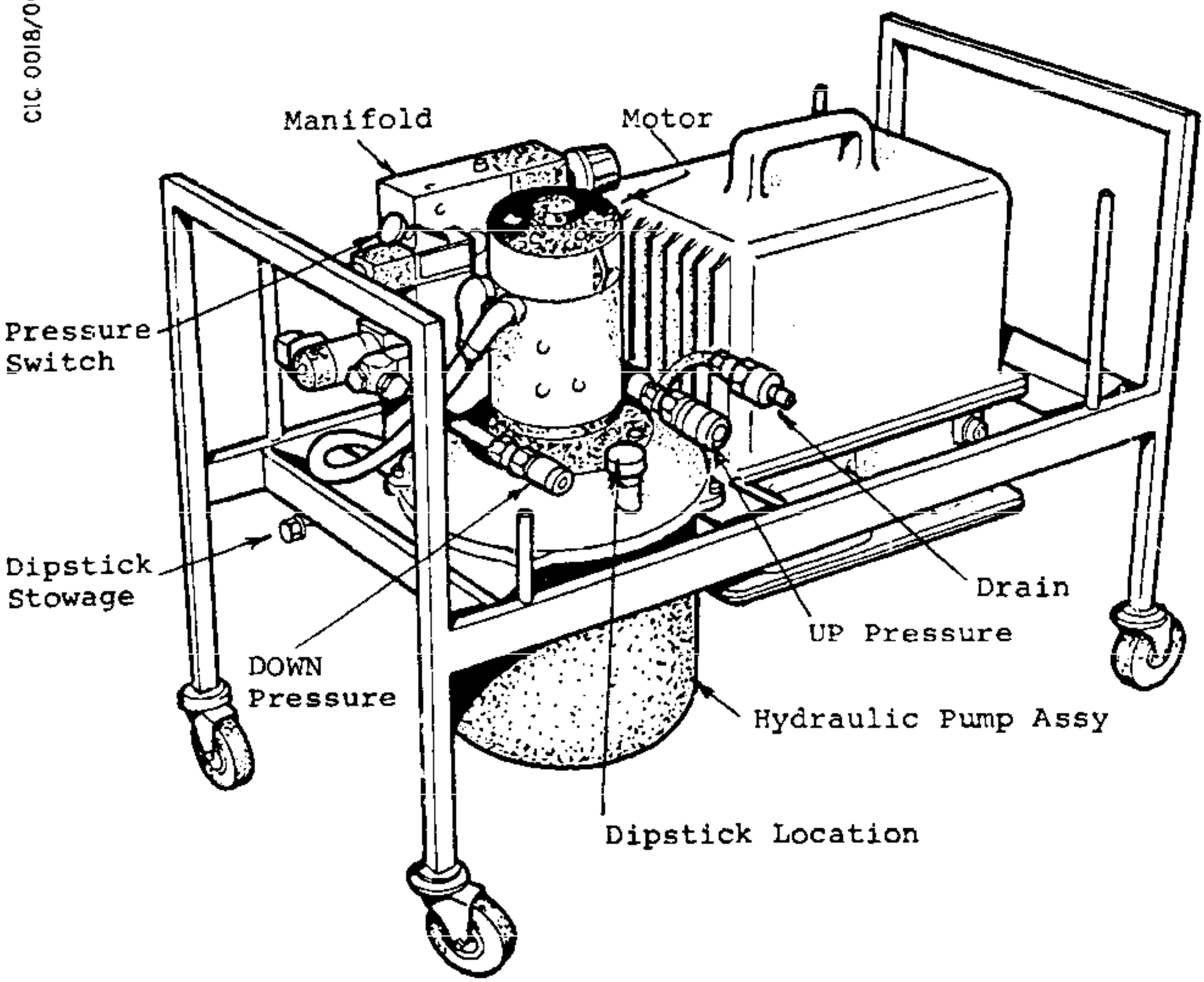
CMB 71 00 12 0 BAMO

Engine Hoist Trolley - Front View
Figure 002

B

R

CIC 0018/00A



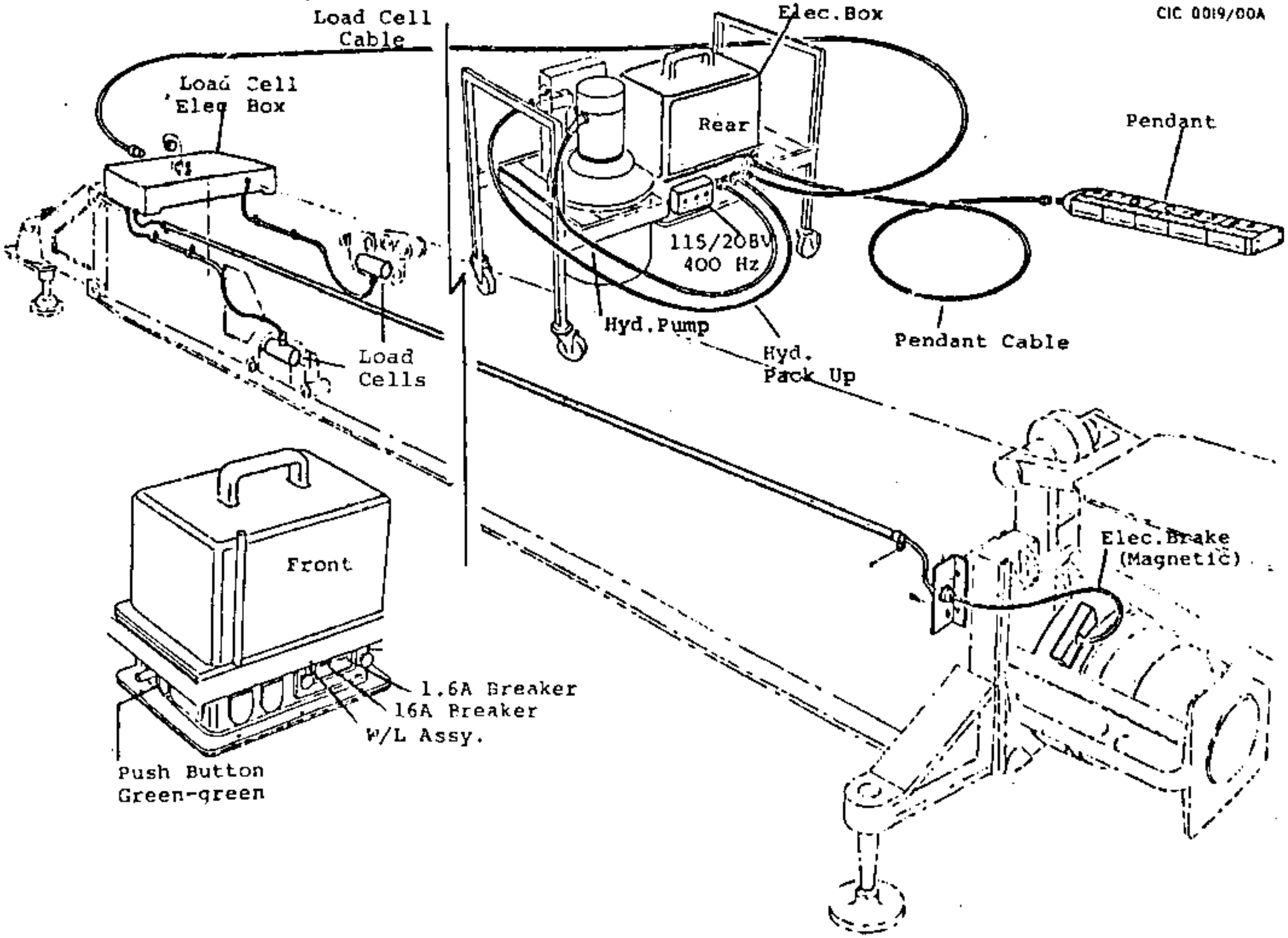
CMB 71 00 12 0 CAMO

Engine Hoist Trolley
Figure 003

B

CMB 71 00 12 0 DAMO

CIC 0019/00A

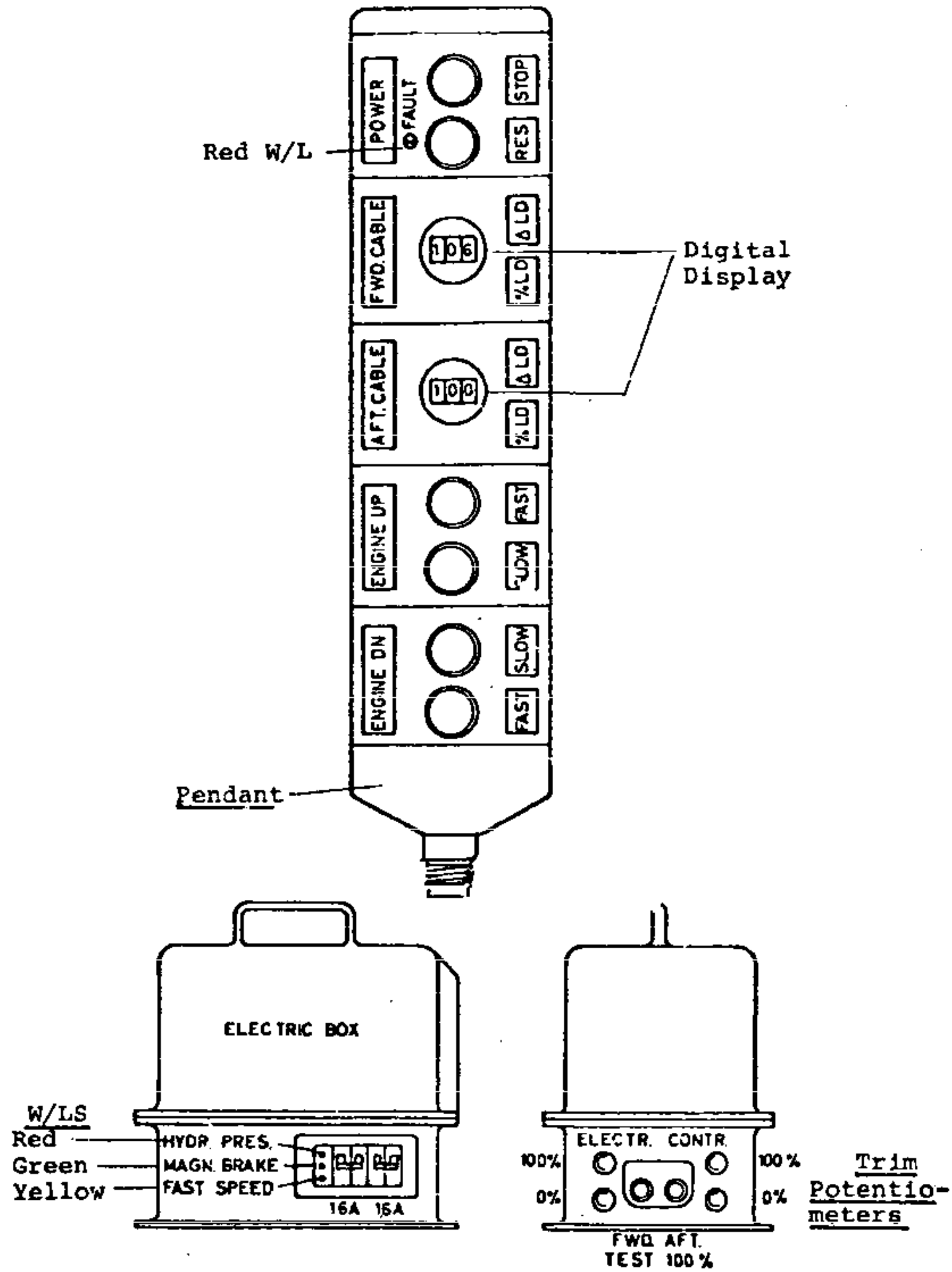


Sabena Hoist Elect. Cable Connections
Figure 004

R

B

CIC 0020/00A



CMB 71 00 12 0 EAMO

Sabena Hoist Pendant & Trimmers
Figure 005

B

(1) Switch ON at GPU.

(2) Fault red light lights up.

(3) Depress power reset.

(4) Digital read out shows.

F. Trimming load cell readings:

(1) No load on cables.

(2) Adjust "0" potentiometer - read 0.

(3) Depress 100% switch - adjust 100% potentiometer - read 100.

R B
R B G. Select down fast:

R B - Pull on cable ends and give sufficient slack on both cables.

R B H. Connect cable ends - and secure pins.

R B I. Tensioning cables:

NOTES: a) Ensure that load cell readings are zero with no load.

b) Check cables are resting correctly in pulley grooves before actuating hoist switch UP SLOW to obtain 100% on one cable. Adjust tension on
R B both cables to read 115%, by actuation of FWD leg screw.

CAUTION: OVERLOADING MAY RUIN THE LOAD CELLS.

R B J. Remove engine trunnion bearing and FWD engine attachments.

R B K. Select DOWN SLOW.

R B Check during operation that both LED read outs show approximately 100%.

R B L. When engine has been lowered approx. 18", install fairleads
R B in wing.

R B M. Select DOWN FAST, when engine is clear of bay.
If one reading shows 80% or under this means engine jamming, hoist will stop. To correct this situation, depress switch UP SLOW and RESET simultaneously until

jamming is eliminated as shown on read out.

STOP hoist - depress DOWN SLOW and then FAST to further lower engine.

N. Stop engine approx. 100 mm (4 in) away from engine stand. Readjust engine centerline if necessary. Remove roll control adjustment if used. Install adapters on engine trunnions.

R B O. Select DOWN SLOW until engine adapters contacts engine cradle.

P. Adjust FWD cradle connecting rods supporting engine and secure to compressor case.

Q. Remove cable from engine hoisting points, if necessary lower front supporting screw at beam to give more slack to cable.

R B 5. EMERGENCY OPERATION OF HOIST

WARNING: ATTENTION ALL PERSONNEL. TO AVOID ACCIDENT OR INJURY OBSERVE THE FOLLOWING:

1. WHEN USING THE EMERGENCY PROCEDURE WITHOUT HYDRAULIC POWER AND AFTER THE ELECTRO-MAGNETIC BRAKE HAS BEEN RELEASED BY USING THE SPECIAL DISTANCE PIECES, THE HOIST RELIES ON ONLY THE RATCHET MECHANICAL BRAKE.

   TAMPERING WITH THE RETAINING RATCHET WOULD UNAVOIDABLY CAUSE THE ENGINE TO DROP.

2. WHEN USING THE EMERGENCY PROCEDURE WITHOUT THE NORMAL ELECTRONIC CONTROL OF THE HOIST THERE IS NO AUTOMATIC RED WARNING LIGHT, DIGITAL DISPLAY OR AUTOMATIC CUT-OUT TO INDICATE UNEQUAL LOADING IN THE HOIST CABLES, THEREFORE IT IS VITALLY IMPORTANT TO CONTINUOUSLY WATCH THE FWD & AFT DIAL INDICATORS FOR RUNAWAY DEFLECTIONS AND BE READY TO REVERSE THE OPERATION TO RESTORE EQUAL TENSIONS IN THE CABLES PRIOR TO REMOVING THE CAUSE OF THE HANGUP OR SNAG.

3. PHYSICALLY CHECK CABLE TENSIONS PRIOR TO DISCONNECTING ENGINE ATTACHMENTS AND DURING LIFTING/LOWERING OPERATIONS.

A. In case of electrical or hydraulic failure, during operation, use the emergency system as follows and observe above warnings.

(1) Remove hydraulic motor from brake assy.

(2) Install emergency set distance pieces
R B PN:5-81659-03-08 on magnetic brake to release
R B brake, as shown (Fig.006).

(3) Install cranking handle PN:5-81659-04-01 and 5-81659-04-02.

(4) Install dial indicators to check cable loads as per
R B (Fig.006).

<u>NOTE</u>: The deflection of the dial indicator measures the loading in the forward and aft cables according to the deflection plate on the hoist forward and aft leg structure.
The deflection diagram plots dial deflection in one hundredths of a millimetre from 100% to 125% cable loading.

R B

(a) The forward adjustable leg should be in the approx. mid position.

(b) Install dial indicators on forward and aft legs and give each dial indicator a 3mm preload with no load on the cables.

Rotate the dial indicator scale to align the
R B zero with the large pointer. Check that the small pointer shows a positive reading of 3 divisions (3 mm preload).

R B (c) Tension forward cable to 100% - for deflection
R B See sub.para.(f)

R B (d) Tension aft cable to 100% - for deflection
R B See sub.para(f).

<u>CAUTION</u>: WATCH DIAL INDICATORS CONTINUOUSLY TO DETECT
R B RUNAWAY FLUCTUATIONS WHICH INDICATE SNAGS OR HANGUPS DURING LIFTING OR LOWERING OF THE ENGINE. OBSERVE THE WARNINGS ON PAGE 15.

R B (e) Lifting - Refer to Deflection Diagram Figure 007.

125% load gives a FWD deflection of 1.37 mm -
R B dial reading 1.63
R B 125% load gives a AFT deflection of 1.21 mm - dial reading 1.79.

R B (f) Lowering - Refer to Deflection Diagram (Figure 007)

100% load gives a FWD deflection of 1.17 mm - dial reading 1.83.
100% load gives a AFT deflection of 0.98 mm - dial reading 2.02.

zero load gives a FWD deflection of 3.0 mm - dial reading 3.0.
zero load gives a AFT deflection of 3.0 mm - dial reading 3.0.

(g) If overloading or hang-ups occur exceeding the deflections in (e) and (f), reverse operations until cable tensions are restored within safe values.

Investigate and cure snags before proceeding to lift or lower the engine.

B. No power 115/208 V.AC 400 Hz available.

R B (1) Use batteries 24 V.DC - 90 A.(Refer to Fig.008.)

(2) Connect batteries directly to electrical motor terminals. + and - terminals not important.

R B (3) Install distance pieces on magnetic brake to keep it released.

R B (4) Install dial indicators to check cables loads (See Para. 5A(4)).

R B (5) Operate solenoid valves UP or DOWN and fast with a screw driver.

R B (6) Observe warnings on page 12.

R B <u>WARNING:</u> CHECK ELECTRICAL MOTOR FOR OVERHEATING. ELECTROMAGNETIC BRAKE MECHANICALLY RELEASED.

R B <u>CAUTION:</u> WHEN DISTANCE PIECES ARE INSTALLED ON ELECTROMAGNETIC BRAKE YOU RELY ONLY ON MECHANICAL BRAKE AS SAFETY AGAINST LOAD DROPPING.

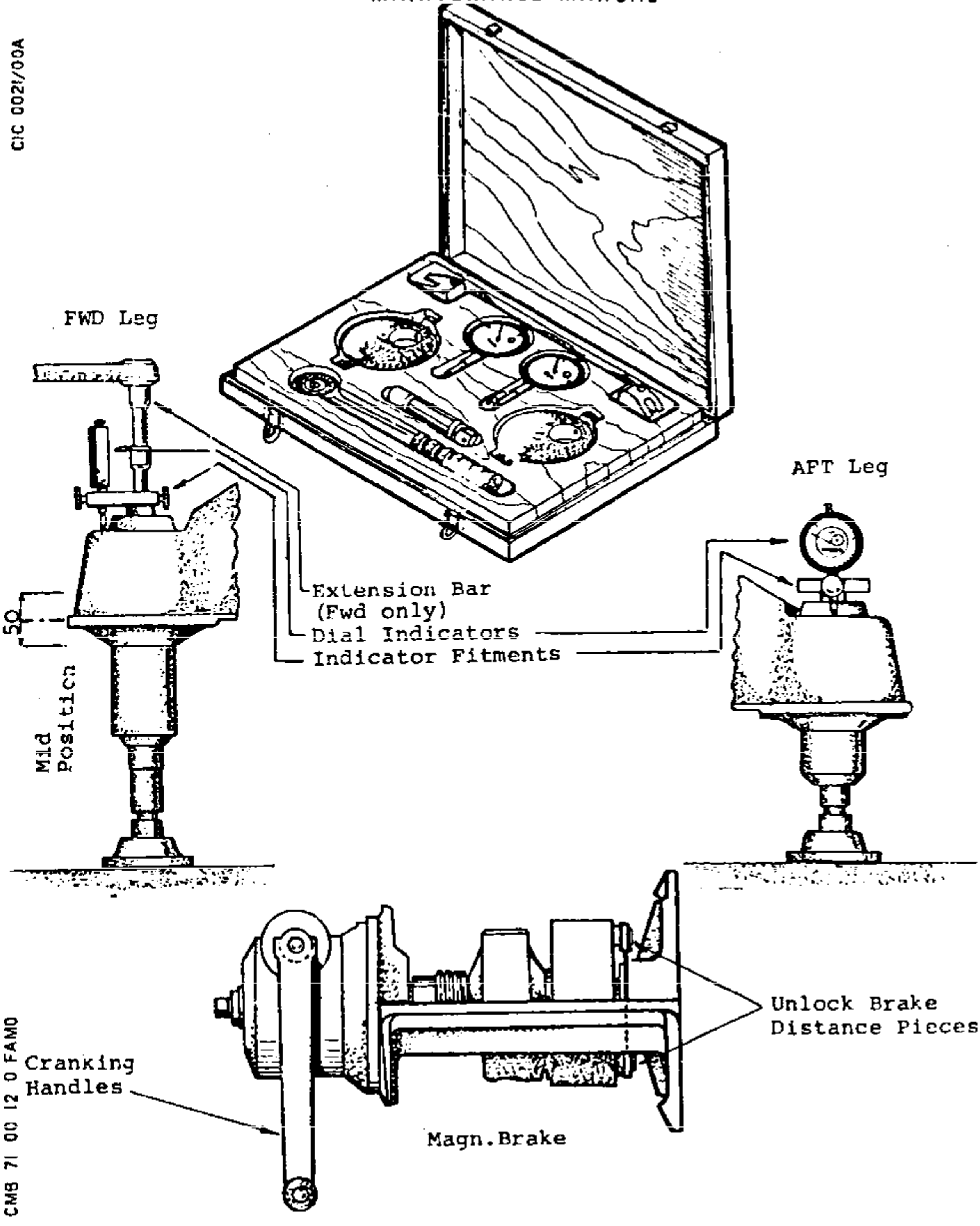
C. Electronic Failure, Load Cells untrimmable - faulty or no digital display on pendant but with electrical power and hydraulic operation.

R B (1) Set up dial indicators as per Para 5A (4).

(2) Use pendant to operate hoist up and down but with operatives watching load deflections on the dial indicators during lifting/lowering operations.

R B (3) Observe warnings on page 12.

CIC 0021/00A

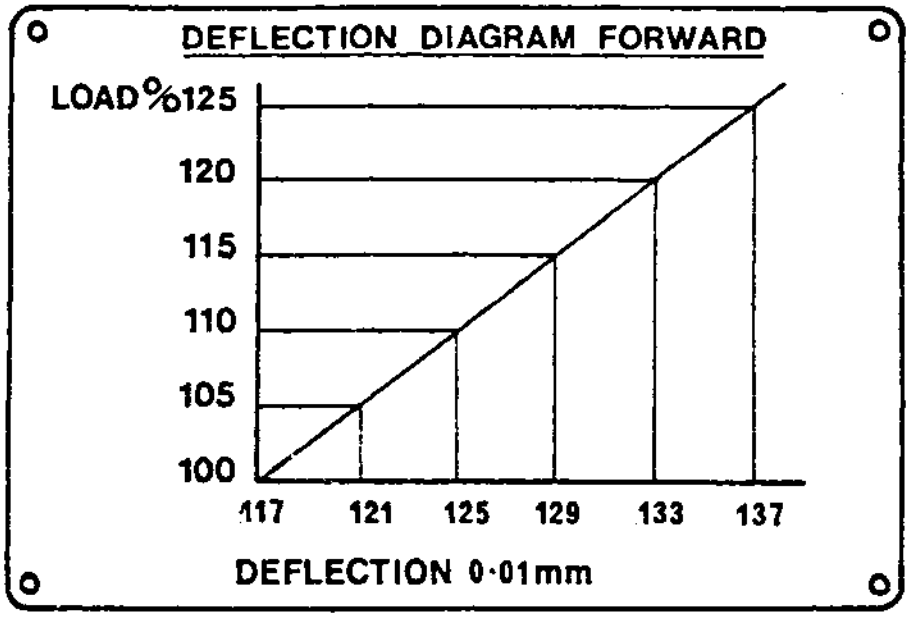


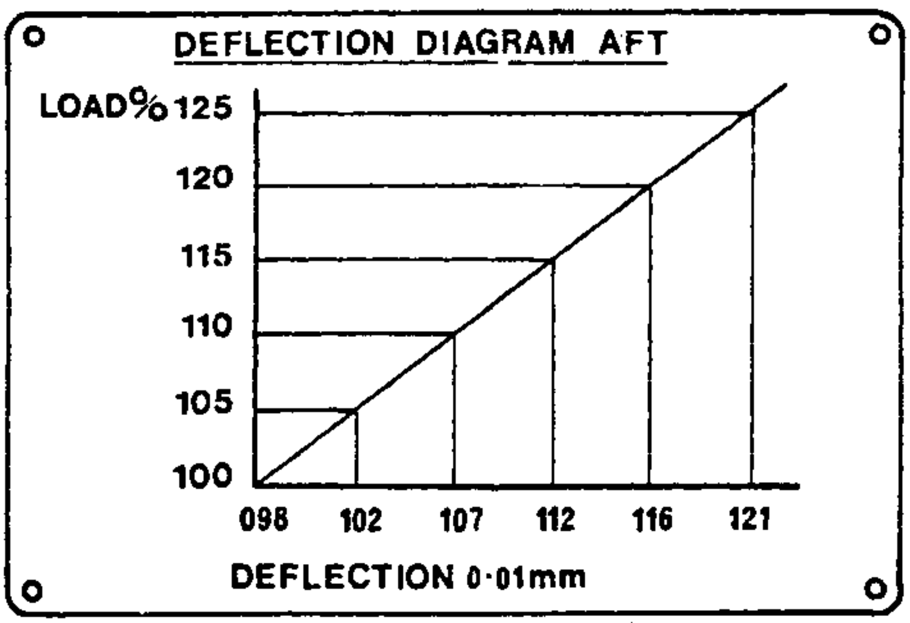
CMB 71 00 12 0 FAM0

Hoist Emergency Operation Components
Figure 006

B

CIC D022/00A





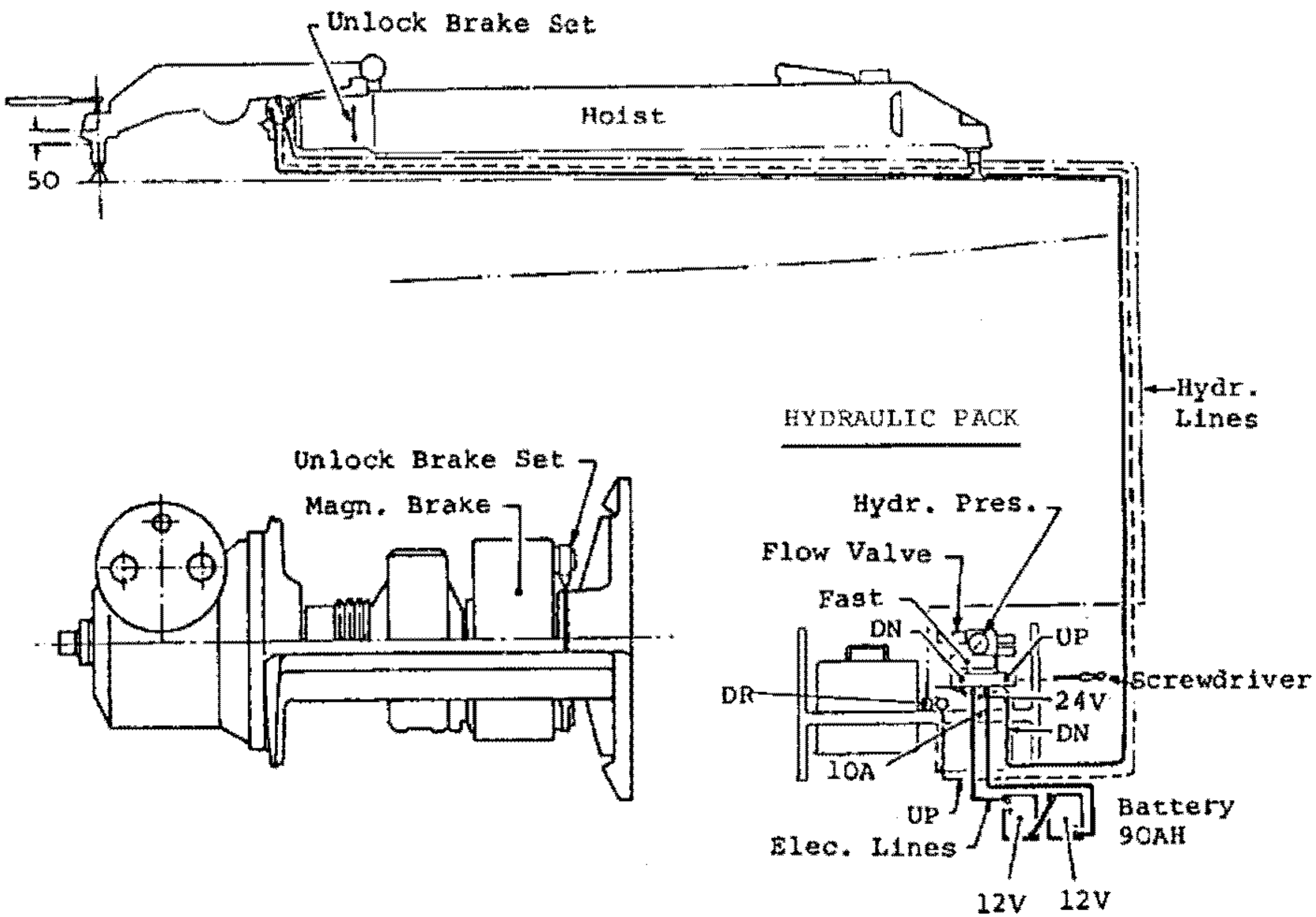
CMB 71 00 12 0 GAMO

Sabena Hoist Deflection Diagrams
Figure 007

B

CMB 71 00 12 0 HAMO

CIC 0023/00A



Emergency Hoist Operation -
Battery driven hydraulics
Figure 008

R

ENGINE - REMOVAL/INSTALLATION

WARNING: OBSERVE THE FOLLOWING SAFETY PRECAUTIONS, ELECTRICAL AS DETAILED IN 24-00-00, HYDRAULIC AS DETAILED IN 29-00-00 AND 71-62-00 SERVICING, AND ON ENTERING ENGINE AIR INTAKES IN 71-00-00 SERVICING.

WARNING: ATTENTION ALL PERSONNEL!
WHEN USING THE EMERGENCY PROCEDURE WITHOUT HYDRAULIC POWER - AND AFTER ELECTRO MAGNETIC BRAKE HAS BEEN RELEASED BY USING THE SPECIAL DISTANCE PIECES - THE HOIST RELIES ON ONLY THE RATCHET MECHANICAL BRAKE.

TAMPERING WITH THE RETAINING RATCHET WOULD UNAVOIDABLY CAUSE THE ENGINE TO DROP.

CAUTION: DURING ENGINE LIFTING AND LOWERING OPERATIONS PHYSICALLY CHECK CABLE TENSIONS BY HAND IN CASE THE ELECTRONIC CONTROL IS FAULTY.

1. General

A. The lifting cables of the Sabena Electro Hydraulic lifting equipment extend through the wing structure to lifting brackets on the engine. Access to the engine is through the engine bay access doors which must be supported in the open position. A six man team is recommended, the disposition of personnel being left to the discretion of the airline operator.

B. Reference - Sabena Olympus Engine Hoist P/No. 5-81659 Ground Equipment Manual.

C. When an engine change takes place, ensure that the following remain with the outgoing engine.

Refer to Fig. 1 - Items 1 thru 8 - Main mount assembly.
Refer to Fig. 2 - Link assy. P/No.E51-143500101 and Item 1 - clevis bolt P/NO.E51-1120000.
Refer to Fig. 3 - Spigot Assy. P/No.D5140500201.

The link and spigot assembly should remain fitted to the outgoing engine and the main mount assemblies put in a plastic bag and tied to the engine.

CAUTION : THE SWAPPING OF ENGINE MOUNT ASSEMBLIES FROM ENGINE TO ENGINE AT ENGINE CHANGE IS CONTRARY TO NORMAL BRITISH AIRWAYS PRACTICE. THE MOUNT ASSEMBLIES MUST REMAIN WITH THE OUTGOING ENGINE SO THAT A WORKSHOP CHECK CAN BE CARRIED OUT ON

B THE MOUNTS IN THE ENGINE SHOP.

2. Engine - Removal

A. Equipment and Materials

	DESCRIPTION	PART NO.
	Equipment for installation/ removal of engine mounting and trunnion nuts, comprising	E935025056
	Box, tool	E935025055
	Bullet, guide - for forward engine mounting (2 off)	D935960100
	Bullet, guide - for trunnion bolts (4 off)	E935025040
	Bullet , guide - for Y restraint spigot	D926347100
B	Socket, forward engine mounts	E930059000
	Spanner, forward engine mounts	14701 NSA 5063/09
B B	Extractor, STA-LOK locking washer, forward engine mounting	E925085031
	Extractor, STA-LOK locking washer	65601 NSA 5064/09
B B	Assembly tool, STA-LOK washer, forward engine mounting	E925085030
	Inserter, STA-LOK locking washer	65062 NSA 5064/09
	Adapter - for Y restraint spigot bearing nut	3-71-1588-1BA
	Bar, extension and guide plate	E935025070
	Tool, extension, 6 in	E97
	Universal joint, 1/2 in drive	E91
	Socket. bi-hex extra deep, 5/8 in x 1/2 in drive	03.42.00.36
	Tool extension, 10 in x 1/2 in drive	3.01.00.03
	Ratchet, 1/2 in square drive	SSDRT 1/2
	Socket, bi-hex extra deep, 1 1/16 in x 3/4 in drive	E935025750
	Universal joint, 3/4 in drive	15.02.00.00
	Ratchet, 3/4 in drive	SSDRT 3/4
	Handle, torque, special	D926349000
	Handle, torque	CCM750
	Handle, torque	LTC. 5
RB	C Spanner, torque, nozzle supply pipe connections	PM82451
	C spanner, torque, fire extinguisher ring flexible pipe	E925148000

	DESCRIPTION	PART NO.
	Circuit breaker safety clips	
	Door opening support equipment comprising:	
	Key for door latches	
	Screwjack/stay, nacelle forward door	E925013000
	Screwjack/stay, nacelle rear door	E925013001
	Bottom lip cover	D926806000
	Engine face cover	PE12325
	Engine hoist assembly SABENA	5-81659
	Engine roll adjuster	D937085000
	Clinometer	-
	Access panel key	E920132000
	Servicing platform	-
	Crawling board	-
	Crane, SWL 11,000 lb (4889 kg)	-
	Drain assembly	PE26796
	Engine Transport Stand	LG11381
	Engine Installation lay by trolley	LG11383
	Cradle assembly, jet pipe	E935002000
	Support arm, jet pipe	E935004000
	Centre wall guide	D937081000
	Outer wall guide and adapter bracket	E935025042
	Outer wall guide support strut	E935025044
	Exhaust cover	-
B B B B	Standard GPU capable of supplying 115-208V AC 400Hz. Plug and receptacle 6 poles AN3114-1B. Current draw 12 amps AC minimum. Protection by 16 amp CB's.	-
	Communications Set	-
	Explosion proof lamps	-
	Portable staging	-
	Rubber mats	-
R B	Wire, nickel chrome 0.031in (0.8 mm) dia	-
	'Never Seez' Lubricating Compound (Ref. 20-30-00, No. 62)	-

DESCRIPTION	PART NO.
Petroleum jelly (Ref.20-30-00,No.27)	-
Torque spanners. Range:	
4-36 lbf in	-
(0.05 - 0.41 mdaN)	-
20-100 lbf in	-
(0.23 - 1.13 mdaN)	-
36-180 lbf in	-
(0.41 - 2.03 mdaN)	-
120-600 lbf in	-
(1.36 - 6.78 mdaN)	-
400;1500 lbf in	-
(4.52 - 16.95 mdaN)	-

B Sabena Hoist - List of equivalent hydraulic oils

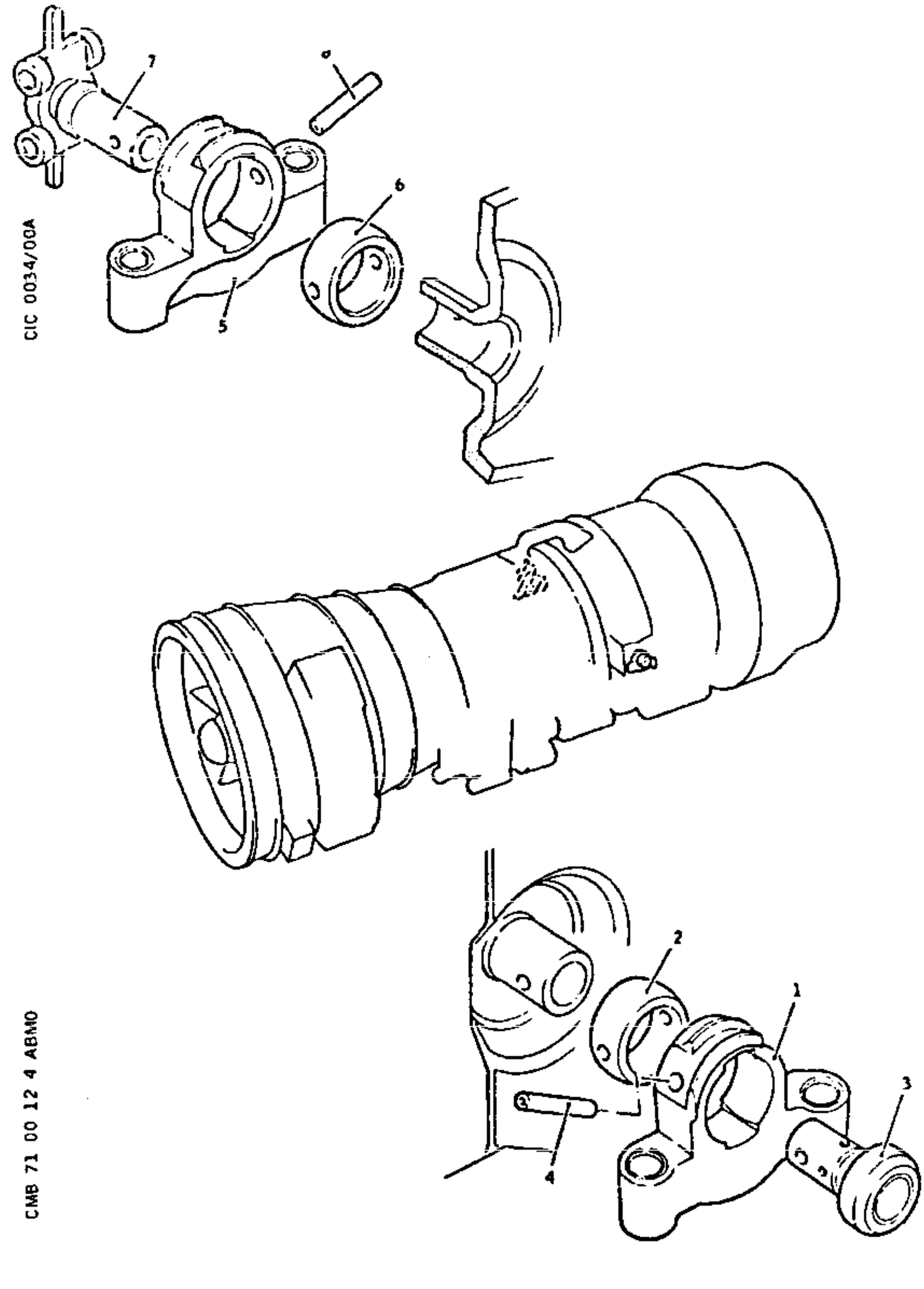
	Normal conditions *	Tropical conditions *
B	(1) Aeroshell fluid No. 4	(1) Fina Hydrant 37
B	(2) DTD 585	(2) Mobil Vactra Heavy Medium
B	(3) Mobil - Aero hydraulic oil A-A	
B		(3) Elf Acantis - 37
B	(4) Esso - Univis J-43	(4) Esso Teresso 52
B	(5) B.P. - Aero hydraulic 1	(5) Shell Tellus 33
B	(6) Texaco, Aircraft hydraulic oil A-A	(6) B.P. Energol

B CAUTION * OILS MAY HAVE TO BE CHANGED - TO COMPENSATE FOR
B CONDITIONS.

B. Prepare to Remove Engine

WARNING: DANGER 200/115 VOLTS CAN BE LETHAL. OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS (Ref.Chapter 24)

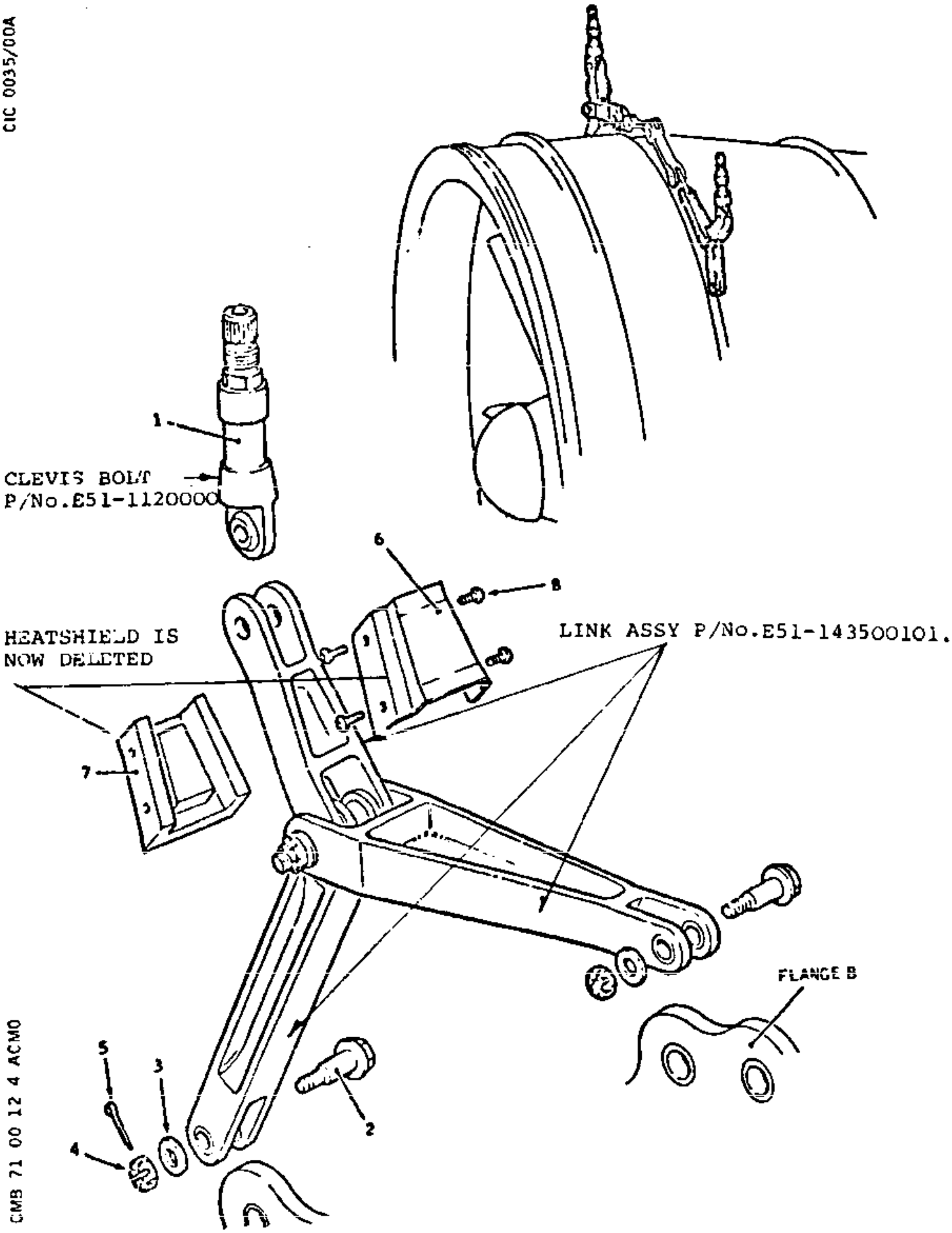
THE ASSOCIATED T1 PROBE HEATER WILL BE SWITCHED ON WHENEVER AN ENGINE HP VALVE SWITCH IS SET TO "OPEN", OR AN ENGINE HP VALVE CONTROL CIRCUIT BREAKER IS TRIPPED, AND WILL ATTAIN OPERATING TEMPERATURE WITHIN 30 s. UNNECESSARY OPERATION OF THE T1 PROBE HEATER(S) MUST BE PREVENTED BY TRIPPING THE ASSOCIATED CIRCUIT BREAKER (S).



Main Engine Mounts
Figure 401

B

CIC 0035/00A

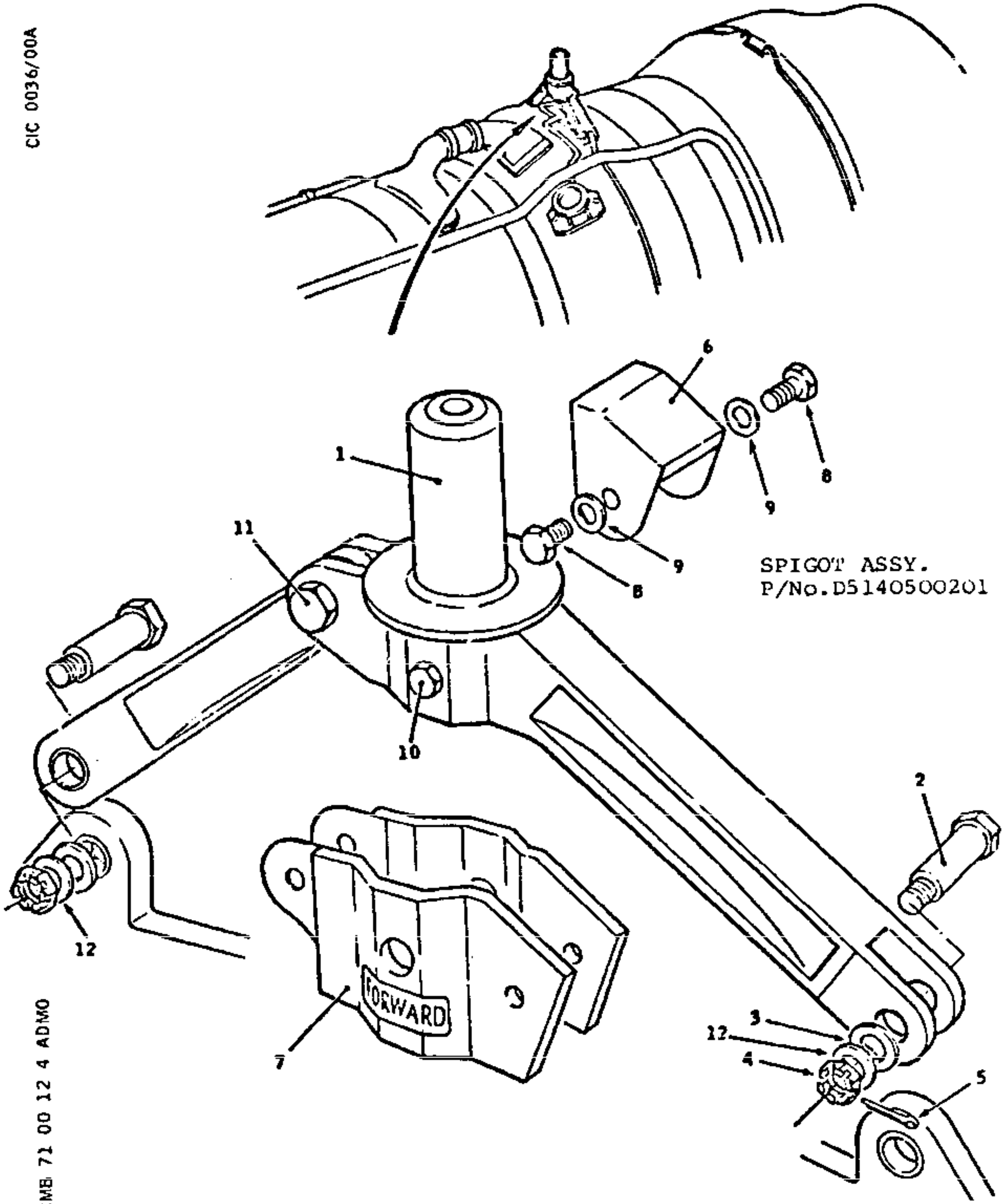


CMB 71 00 12 4 ACMO

Front Mount Link Assy
Figure 402

B

CIC 0036/00A



CMB 71 00 12 4 ADMO

Centre Mount Spigot Assy
Figure 403

B

NOTE: The two engines in each nacelle can only be removed and installed separately, although certain preparatory operations on the engines may be undertaken simultaneously to reduce the overall time to complete engine change operations.

CAUTION: ENSURE THAT THE AIRCRAFT LATERAL DATUM IS LEVEL TO WITHIN 1 DEG. AND THAT THE AIRCRAFT IS NOT MORE THAN 2 DEG 43 MINS NOSE UP

(1) If the aircraft is on jacks ensure that the aircraft horizontal datum is not more than 19.5 ft (6 m) above ground level.

(2) If the aircraft is not on jacks, ensure that ground locks are fitted to the nose and main undercarriages and that the wheels are chocked.

(3) Ensure that adequate fire fighting equipment is positioned in the immediate working area.

(4) Close the relevant LP fuel isolation valve:

(a) Make available electrical ground power (Ref. 24-41-00).

(b) Lift the guard and operate the switch engraved 'LP VALVE' on the fuel management panel (10-122) to 'SHUT 1' or 'SHUT 2'.

(c) Check that the adjacent indicator shows cross line (horizontal).

(5) Depressurize the hydraulic systems (Ref. 29-00-00 Servicing):

The yellow and main system if working in engine bays 2 and 4.

The main system only if working in engine bays 1 and 3.

(6) Switch off and disconnect electrical ground power (Ref. 24-41-00).

(7) Electrically isolate the engine by tripping the appropriate circuit breakers, or by disconnecting the aircraft electrical power supplies (Ref. 24-41-00). Secure each circuit breaker with a safety clip.

SERVICE	PANEL	MAP REFERENCE
B Engine No. 1		
B CSD Low Oil Pressure Switch	1-213	R8
B NI Governor Control Valve	1-213	C1
B CSD Disc Solenoid	1-213	R7
B HE Ignitor Box RH	1-213	N6
B Main Throttle Fail Ind.	1-213	A1
B Wind Down Control Supply 2	1-213	C7
B Bleed Valve Control	1-213	D10
B Cond. Valve Close	1-213	D11
B Cross Bleed Control	1-213	D12
B Air Generation Control	1-213	D13
B Fuel Start Pump Supply	1-213	J6
B HE Ignitor Supply RH	1-213	N5
RB Air Cond. Valve Emer. Close Sup.	1-213	F13
B Main Throttle Actuator	2-213	F12
B Sec. Air Door Motor Supply	2-213	C10
B HE Ignitor Supply LH	2-213	BA 001, G10 Effectivity
B HE Ignitor Supply LH	2-213	BA 002, E12 Effectivity
B N2 RPM Indication	2-213	BA 001, D10 Effectivity
B N2 RPM Indication	2-213	BA 002, G10 Effectivity
B EGT Indication	2-213	G12
B Fuel Recirc Control Valve	3-213	G1
B HP Shut-Off Valve	3-213	C1
B HE Ignitor Box LH	3-213	E1
B Main Throttle Control	3-213	A1
B Alt. Throttle Fail Ind.	3-213	B1
B Shut Down Control	3-213	F3
B Fuel Inlet Temp	4-213	E20
B Internal O/H Ind.	4-213	BA 001, E18 Effectivity
B Internal O/H Ind.	4-213	BA 002, D19 Effectivity
B N1 RPM Indication	4-213	BA 001, D19 Effectivity
B N1 RPM Indication	4-213	BA 002, E18 Effectivity
B Fuel Filter Diff. Switch	5-213	B5
B No. 4 Bearing Oil Temp	5-213	E1
B Engine Oil LP Switch	5-213	A1
B Wind Down Control Supply 1	5-213	B1
B Wind Down Indication	5-213	B3
B Start Pump Control	5-213	D3
B T1 Probe Heater Supply	13-215	C9
B Re-heat Motor Control	14-215	BA 001, C13 Effectivity
B Re-heat Motor Control	14-215	BA 002, C12 Effectivity
B No. 1 Engine Oil Contents	14-215	D14
B Flowmeter Trans.	14-215	C15
B Alt. Throttle Actuator	14-215	G12
B Oil Pressure Indication	14-215	C14

SERVICE	PANEL	MAP REFERENCE
B Aj Indication	14-215	BA 001, C12 Effectivity
B Aj Indication	14-215	BA 002, C13 Effectivity
B Air Start Valve Control	15-215	C15
B CSD Oil Temp.	15-215	D2
B Eng. 1 Green Pump Control	15-215	D6
B HP Fuel Valve Position Supply	13-216	A6
B Re-heat Motor Control	15-216	E9
B Air Start Valve Position Ind.	15-216	D9
B Anti-Ice Control Valve Solenoid	15-216	C10
B Fuel Heater Auto Control	15-216	A11
B HP Valve Position Ind.	15-216	A10
B Alt. Throttle Control	15-216	E8
B LP Valve Supply 1	15-216	C1
B Engine No. 2		
B Fuel Recirc Control Valve	1-213	E5
B Fuel Filter Diff. Switch	1-213	F8
B No. 4 Bearing Oil Temp.	1-213	D5
B CSD Low Oil Pressure Switch	1-213	R7
B CSD Disc Solenoid	1-213	R8
B Engine Oil LP Switch	1-213	C5
B HE Ignitor Box RH	1-213	P6
B HE Ignitor Supply RH	1-213	P5
B HP Shut Off Valve	1-213	C3
B Main Throttle Control	1-213	A3
B Alt. Throttle Fail Ind.	1-213	B3
B Shut Down Control	1-213	D1
B Wind Down Control Supply 1	1-213	F4
B Wind Down Indication	1-213	F6
B Start Pump Control	1-213	G5
B Start Pump Supply	1-213	K6
B Main Throttle Actuator	2-213	C12
B HE Ignitor Supply LH	2-213	B10
B EGT Indication	2-213	BA 001, B12 Effectivity
B EGT Indication	2-213	BA 002, D10 Effectivity
B N2 RPM Indication	2-213	BA 001, D11 Effectivity
B N2 RPM Indication	2-213	BA 002, D12 Effectivity
B Sec Air Door Motor Supply	2-213	F10
B N1 Governor Control Valve	3-213	D3
B HE Ignitor Box LH	3-213	E2
B Main Throttle Fail Ind.	3-213	A3
B Fuel Inlet Temp.	4-213	B20
B Internal O/H Ind.	4-213	B18
B N1 RPM Indication	4-213	C19
B Bleed Valve Control	5-213	A8

SERVICE	PANEL	MAP REFERENCE
B Cond. Valve Close	5-213	A9
B Wind Down Control Supply 2	5-213	C1
B Cross Bleed Control	5-213	F8
RB Air Cond. Valve Emer. Close Sup.	5-213	A10
B No.2 Eng. Oil Contents	13-215	BA 002, D14 Effectivity
B Air Generation Control	5-213	F9
B Re-heat Motor Control	13-215	B14
B No. 2 Engine Oil Contents	13-215	BA 001, G13 Effectivity
B HP Fuel Valve Position Supply	13-215	BA 001, D14 Effectivity
B HP Fuel Valve Position Supply	13-215	BA 002, G13 Effectivity
B Oil Pressure Indication	13-215	C13
B Aj Indication	13-215	BA 001, E13 Effectivity
B Aj Indication	13-215	BA 002, D13 Effectivity
B Alt Throttle Actuator	13-215	F14
B Flowmeter Trans.	13-215	BA 001, B17 Effectivity
B Flowmeter Trans.	13-215	BA 002, D16 Effectivity
B T1 Probe Heater Supply	14-215	E8
B Re-heat Motor Control	15-215	D15
B Eng. 2 Yellow Pump Control	15-215	B8
B Air Start Valve Position Ind.	15-215	C16
B CSD Oil Temp.	15-215	D2
B Anti-Ice Control Valve	15-215	B15
B Fuel Heater Auto Control	15-215	E16
B Eng. 2 Green Pump Control	15-215	D7
B HP Valve Position Ind.	15-215	B17
B Alt Throttle Control	15-215	F15
B Air Start Valve Control	15-216	D11
B LP Valve Supply 1	3-213	A5
B Engine No. 3		
B Fuel Filter Diff. Switch	1-213	F8
B No. 4 Bearing Oil Temp.	1-213	D6
B HE Ignitor Box RH	1-213	Q6
B Fuel Recirc Control Valve	1-213	E6
B Engine Oil LP Switch	1-213	C6
B HP Shut Off Valve	1-213	C4
B Main Throttle Control	1-213	A4
B Alt Throttle Fail Ind.	1-213	B4
B Shut Down Control	1-213	D2
B Wind Down Control Supply 1	1-213	F5
B Wind Down Indication	1-213	F7
B Start Pump Control	1-213	G6
B Start Pump Supply	1-213	L6
B HE Ignitor Supply RH	1-213	Q5

SERVICE	PANEL	MAP REFERENCE
B Main Throttle Actuator	2-213	C13
B EGT Indication	2-213	BA 001, B13 Effectivity
B EGT Indication	2-213	BA 002, D11 Effectivity
B HE Ignitor Supply LH	2-213	B11
B N2 RPM Indication	2-213	BA 001, D12 Effectivity
B N2 RPM Indication	2-213	BA 002, D13 Effectivity
B CSD Low Oil Pressure Switch	3-213	G9
B N1 Governor Control Valve	3-213	D4
B CSD Disc Solenoid	3-213	G8
B HE Ignitor BOx LH	3-213	E3
B Main Throttle Fail Ind.	3-213	A4
B Fuel Inlet Temp.	4-213	B21
B Sec Air Door Motor Supply	4-213	A19
B Internal O/H Ind.	4-213	B19
B N1 RPM Indication	4-213	C20
B Wind Down Control Supply 2	5-213	C2
B HP Fuel Valve Position Supply	13-215	BA 001, D14 Effectivity
B HP Fuel Valve Position Supply	13-215	BA 002, G13 Effectivity
B Air Start Valve Position Ind.	15-215	C17
B Fuel Heater Auto Control	15-215	E16
B Eng. 3 Blue Pump Control	15-215	E7
B Re-heat Motor Control	15-215	D16
B Anti-Ice Control Valve	15-215	B16
B Cond. Valve Close	15-215	A3
B Bleed Valve Control	15-215	A4
B Air Generation Control	15-215	B3
B Cross Bleed Control	15-215	B4
B HP Valve Position Ind.	15-215	B17
B Alt Throttle Control	15-215	F16
RB Air Cond. Valve Emer. Close Sup.	15-215	F2
B Re-heat Motor Control	13-216	BA 001, B5 Effectivity
B Re-heat Motor Control	13-216	BA 002, B7 Effectivity
B No. 3 Engine Oil Contents	13-216	BA 001, D7 Effectivity
B No. 3 Engine Oil Contents	13-216	BA 002, D6 Effectivity
B Flowmeter Trans	13-216	D4
B Oil Pressure Ind.	13-216	BA 001, B7 Effectivity
B Oil Pressure Ind.	13-216	BA 002, B5 Effectivity
B Alt. Throttle Actuator	13-216	BA 001, C5 Effectivity
B Alt. Throttle Actuator	13-216	BA 002, A7 Effectivity
B Aj Indication	13-216	B6
B T1 Probe Heater Supply	14-216	C14
B Air Start Valve Control	15-216	D11
B CSD Oil Temp.	15-216	C25
B LP Valve Supply 1	3-213	A6

SERVICE	PANEL	MAP REFERENCE
B Engine No. 4		
B N1 Governor Control Valve	1-213	C2
B HE Ignitor Box RH	1-213	R6
B HE Ignitor Supply RH	1-213	R5
B Main Throttle Fail Ind.	1-213	A2
B Wind Down Control Supply 2	1-213	C8
B Fuel Start Pump Supply	1-213	M6
B Main Throttle Actuator	2-213	F13
B HE Ignitor Supply LH	2-213	BA 001, G11 Effectivity
B HE Ignitor Supply LH	2-213	BA 002, E13 Effectivity
B N2 RPM Indication	2-213	BA 001, D13 Effectivity
B N2 RPM Indication	2-213	BA 002, G11 Effectivity
B EGT Indication	2-213	G13
B CSD Low Oil Pressure Switch	3-213	G8
B CSD Disc Solenoid	3-213	G9
B HE Ignitor Box LH	3-213	E4
B Fuel Recirc Control Valve	3-213	G2
B HP Shut Off Valve	3-213	C2
B Main Throttle Control	3-213	A2
B Alt Throttle Fail Ind.	3-213	B2
B Shut Down Control	3-213	F4
B Fuel Inlet Temp	4-213	E21
B N1 RPM Indication	4-213	BA 001, D20 Effectivity
B N1 RPM Indication	4-213	BA 002, E19 Effectivity
B Internal O/H Ind.	4-213	BA 001, E19 Effectivity
B Internal O/H Ind	4-213	BA 002, D20 Effectivity
B Sec Air Door Motor Supply	4-213	F19
B Fuel Filter Diff. Switch	5-213	B5
B No. 4 Bearing Oil Temp.	5-213	E2
B Engine Oil LP Switch	5-213	A2
B Wind Down Control Supply 1	5-213	B2
B Wind Down Ind.	5-213	B4
B Start Pump Control	5-213	D4
B Eng. 4 Yellow Pump Control	15-215	B9
B Air Start Valve Control	15-215	C15
B Eng. 4 Blue Pump Control	15-215	E8
B HP Fuel Valve Position Supply	13-216	A6
B T1 Probe Heater Supply	13-216	C11
B Aj Indication	14-216	B6
B Re-heat Motor Supply	14-216	D7
B No. 4 Engine Oil Contents	14-216	E6
B Flowmeter Trans.	14-216	B3
B Alt Throttle Actuator	14-216	C7
B No. 4 Oil Pressure Ind.	14-216	D6
B LP Valve Supply 1	15-216	C2

SERVICE	PANEL	MAP REFERENCE
B HP Valve Position Ind.	15-216	A10
B Bleed Valve Control	15-216	A23
B Cond. Valve Close	15-216	A24
B Air Generation Control	15-216	B23
B Cross Bleed Control	15-216	B24
B Alt Throttle Control	15-216	F9
B Re-heat Motor Control	15-216	E10
B Air Start Valve Position Ind.	15-216	D10
B CSD Oil Temp	15-216	C25
B Fuel Heater Auto Control	15-216	A11
B Anti-Ice Control Valve	15-216	C11
RB Air Cond. Valve Emer. Close Sup.	15-216	F26

(8) Display a warning placard on the engine starting panel to indicate that personnel are working in the power plant area.

(9) Fit the air intake protection equipment (Ref. 71-00-00, Servicing).

(10) Open and support the engine bay doors:

(a) Open the engine bay doors, lower and side panel, front and rear. (Ref. 71-00-00, Servicing).

(b) Support the engine bay doors and side panels (Ref. 71-00-00, Servicing).

(11) Protect the top surface of the wing above the engine with rubber mats.

(12) Gain access to the engine lifting brackets in the wing structure by removing each of the access panels and covers from the wing.
B (Ref. Fig. 404, 405 and 406)

(a) Engage the key with the panel lock and turn it 90 deg anti-clockwise, remove the key complete with the panel attached.

(b) Disengage the key from the panel, by turning the key 90 deg in a clockwise direction.

(c) Remove the cover and cup heatshield from each engine lifting cable hole in the bottom of the equipment bay.

(13) Fit the two engine hoist locating bushes, by pushing each spring loaded disc downward with a bush, and turning the bush 90 deg clockwise to secure it.

(14) Using a crane lift the engine hoist onto the wing

B Alternatively, each part of the hoist can be
B manhandled on to the wing and assembled in situ -
B see para. (15).

<u>WARNING</u>: ENSURE THAT THE AREA IN THE VICINITY OF THE WING ABOVE THE RELEVANT ENGINE

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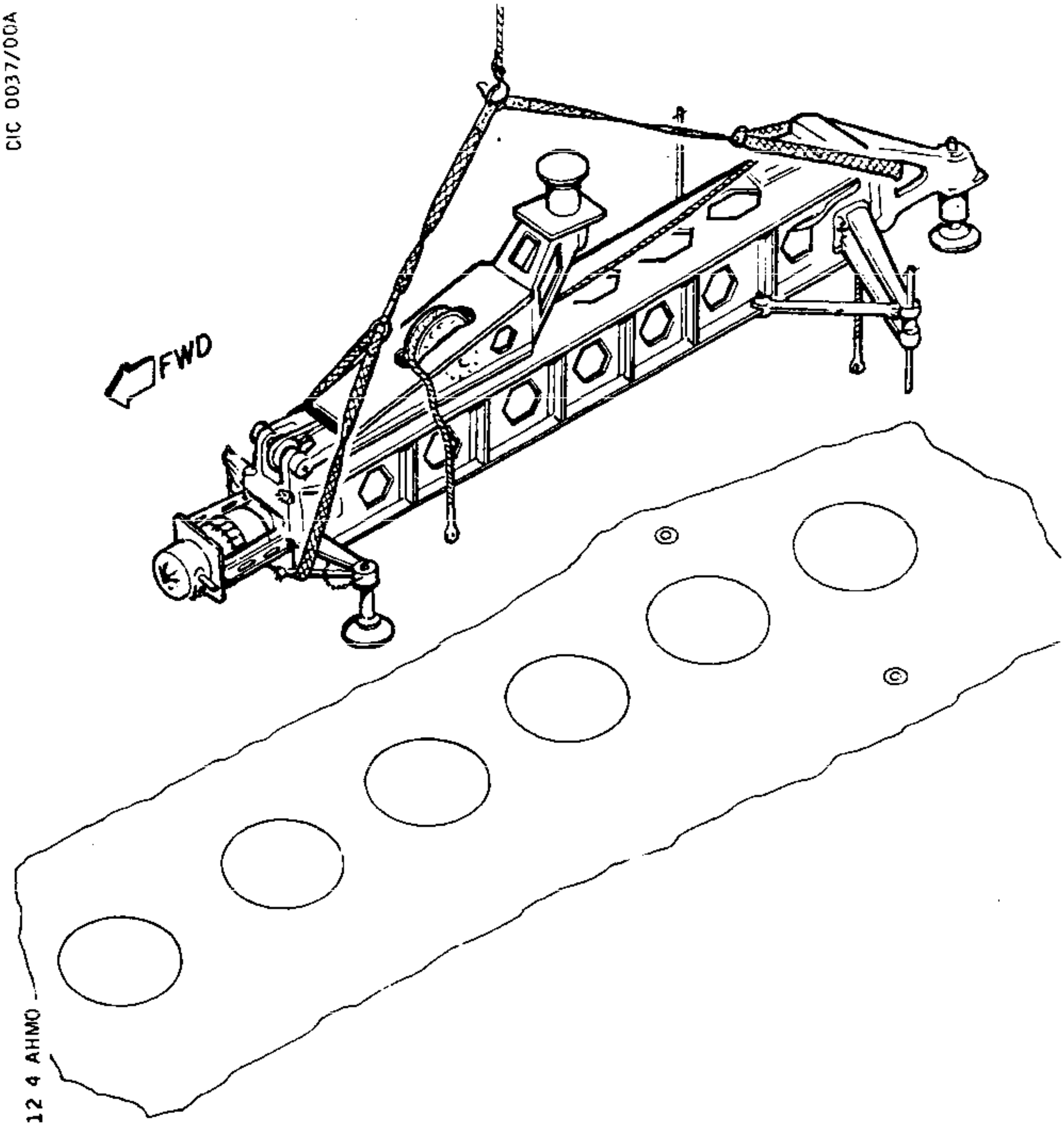

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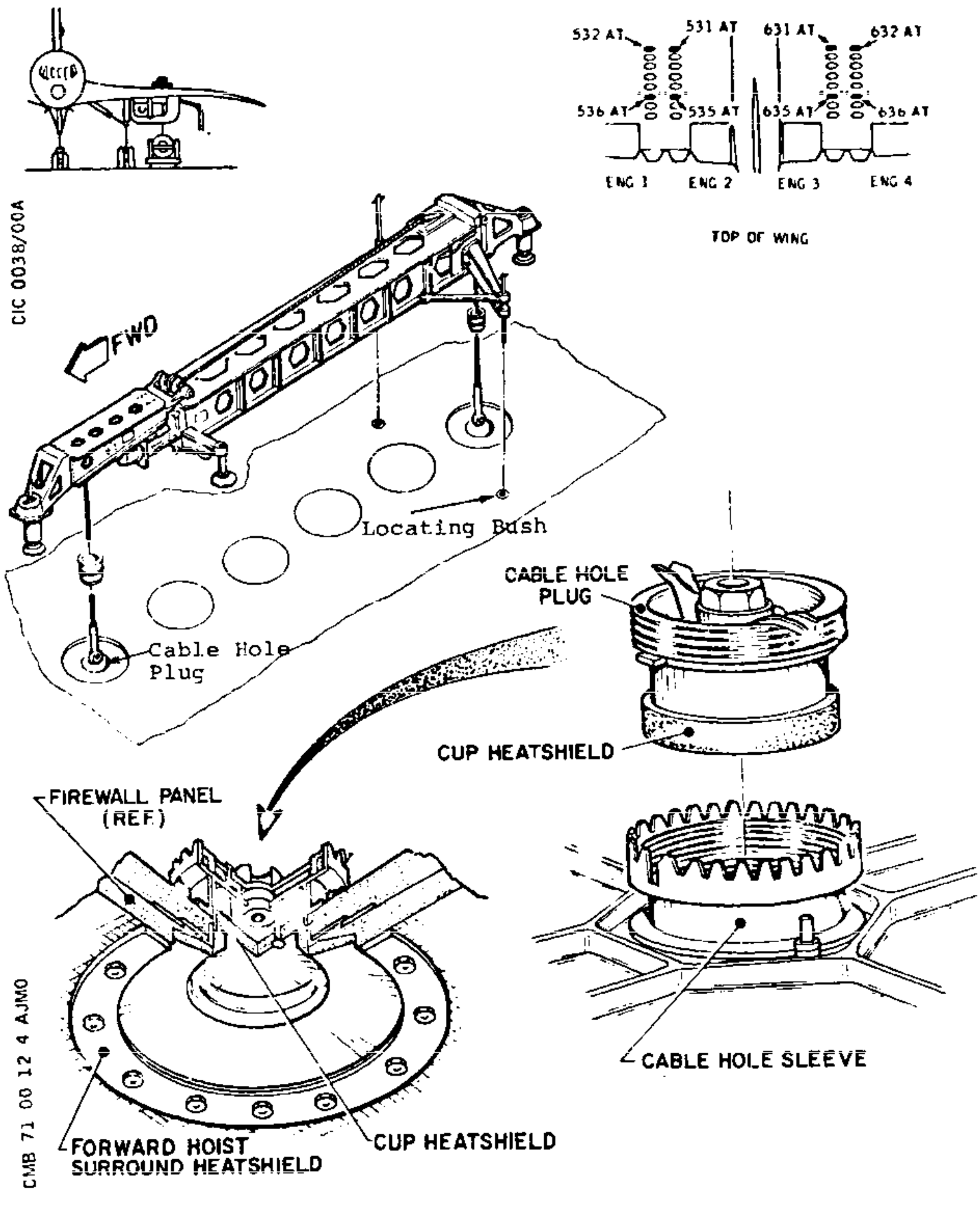
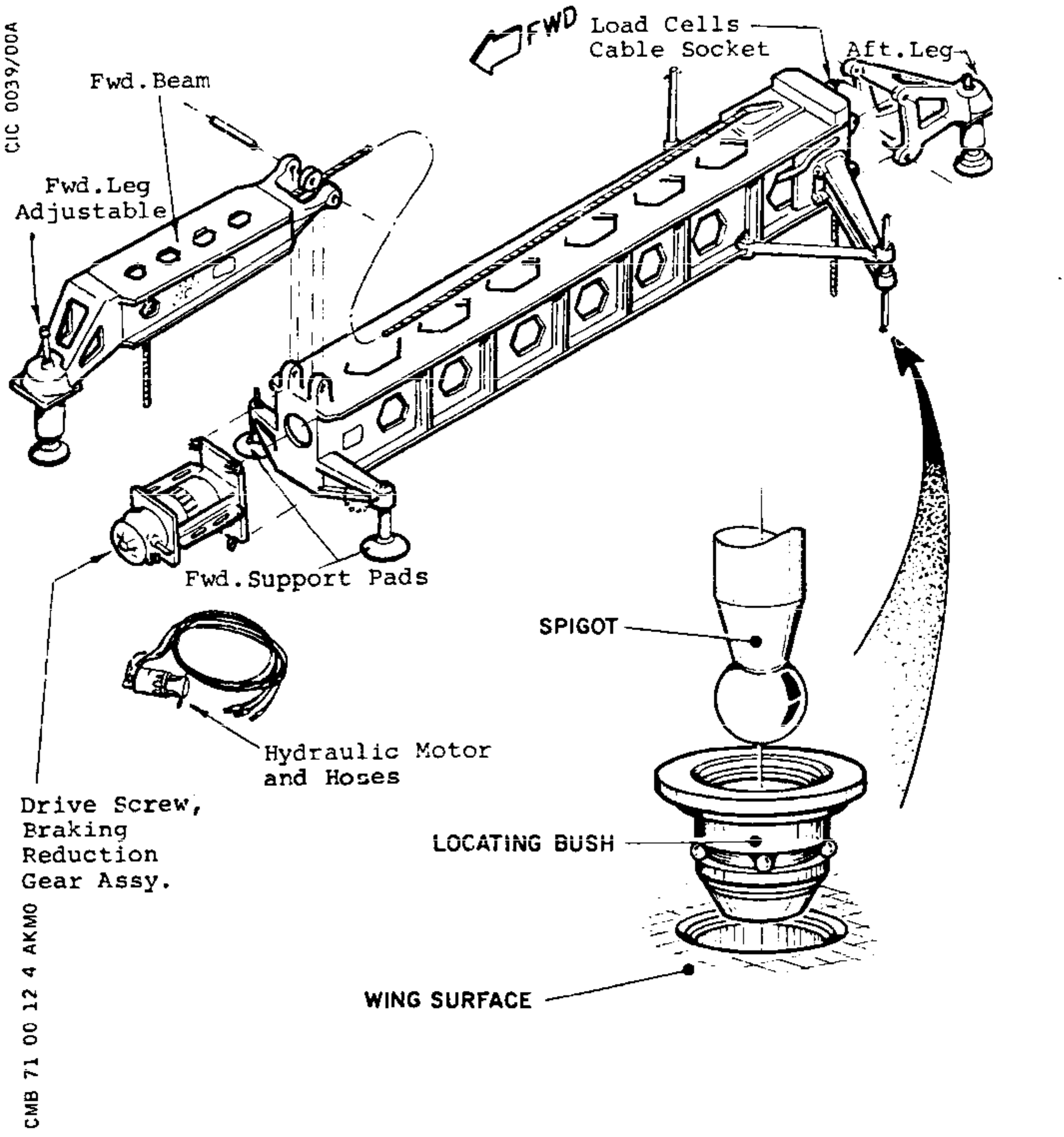
Engine Hoist Slinging
Figure 404

B



Engine Hoist
Figure 405

B



Engine Hoist Main Assemblies
Figure 406

B

BAY IS CLEAR OF PERSONNEL OTHER THAN THOSE NECESSARY FOR ENGINE CHANGE OPERATIONS.

(a) Ensure that the forward support pad long leg is fitted outboard and the short leg is fitted inboard.

CAUTION : IF THE ABOVE IS NOT OBSERVED AND LOWERING OF THE ENGINE COMMENCES IT CAN FOUL UP AND CANNOT BE WOUND UP AGAIN BECAUSE THE HOIST WILL BE ADVERSELY TILTED RELATIVE TO THE VERTICAL LOWERING/RAISING CENTRE LINE AXIS OF THE ENGINE BAY.

(b) Lower the hoist on to the wing and align the locating spigots with the bushes in the wing ensuring the forward support pads sit squarely on the wing. Remove the sling.

(c) Rotate forward beam forward until forward leg support pad contacts wing surface. Adjust to mid-position - see Fig. 406.

(d) Ensure front and rear hoist cables sit correctly in the vees of their respective pulleys.

Proceed to item (15) (i) unless (15) (a) thru (h) apply.

(15) If suitable lifting tackle is not available to lift the engine hoist, disassemble the hoist and manhandle the components on to the wing.

<u>NOTE</u>: Each component part of the engine hoist can be lifted by two operators.

(a) Remove the pip pins and separate the forward beam with the adjustable forward leg from the aft beam.
Disengage cable from pulley and stow end.

(b) Remove aft leg support from beam.

(c) Loosen off red painted knobs and remove speed reducer and drive screw casing assembly.

(d) Position suitable platform steps to rear of engines and adjacent to aircraft wing. Protect wing areas as necessary with rubber mats.

B Manhandle the separate assemblies on to the wing.

B (e) Engage the aft spigots of the aft beam with the
B locating bushes on the wing. The forward support
B pads should sit squarely on the wing.

B CAUTION : ENSURE THE FORWARD SUPPORT PAD LONG
B LEG IS FITTED OUTBOARD AND THE FORWARD
B SUPPORT PAD SHORT LEG IS FITTED
B INBOARD.

B (f) Refit the aft leg support to the beam.

B (g) Refit the speed reducer and drive screw casing
B assembly. Ensure red knobs are tight.

B (h) Refit forward beam and engage cable in vee of
B pulley.

B (i) Adjust the forward leg approx. halfway.

B (j) Fit the hydraulic motor to the speed reducer
B shaft and couple the three hoses to their
B respective connections on the trolley hydraulic
B manifold.

B (k) Remove blanking plug from top of hydraulic
B reservoir and fit dipstick. Check oil level.

B NOTE : The dipstick is stowed at bottom edge of
B trolley frame.

B Stow blank when dipstick is in use.

B (l) Connect the electrical "lead" from the pendant
B to the electrical box.

B (m) Connect the electrical lead between load cells
B and electrical box.

B (n) Connect the GPU electrical supply to the
B trolley.

B CAUTION : TO AVOID DAMAGING THE PLUG PINS,
B USE EXTREME CARE WHEN INSERTING
B ELECTRICAL PLUG.

(o) Power On - switch on at G.P.U.

B NOTE ; Should the electrical supply fail operate
B the hoist manually.

See Emergency Operation. (Ref 71-00-12 P/B 1-100 Para.5)

(p) Main electrical box warning lights.

(i) Red-hydraulic pressure: illuminates when hydraulic pressure is low.

(ii) Green-magn. brake: illuminates when electromagnetic brake is released.

(iii) Yellow-fast speed: illuminates when high speed is in operation.

(q) Breakers: - (Ref 71-00-12 P/B 1-100 Fig 004)

16 Amps - main power protection for hydraulic pack.
1.6 Amps - protection of electronics and electrical controls.

NOTE : During road transportation, it may happen that breakers spring open. Check for correct condition before operation.

(r) Control Pendant - (Ref 71-00-12 P/B 1-100 Fig 005)

(i) Stop switch: cuts off ground power unit relay.

(ii) Reset switch:
Arms the system when power is applied, and allows a return to normal working after a fault condition has occurred .

(iii) Fault red light on: indicates:
1/load: $\pm$ 125%, or
2/load disparity: $\pm$ 20%.

(iv) Load indicators:
Give in percent of nominal load the forces acting on each cable, as a digital display.

(v) Engine UP and DOWN.

Use SLOW or FAST switches as required.

NOTE : Fault red light illuminated, depress RESET before

B operating further UP or DOWN switch.

B (s) Trimming load cells reading on pendant display.

B NOTE : '0' and 100% trim potentiometers are located
B at the base of the trolley electrical box.

B (i) Zeroing load cells:
B With no load on cables, power ON. Trim
R B on 2 potentiometers marked 0 to read zero
R B on digital read out.

B (ii) Adjusting load cells for 100%.
B With no load on cables - depress 100% FWD or
B or AFT.
R B Trim on 2 potentiometers marked 100% to
R B read 100%.

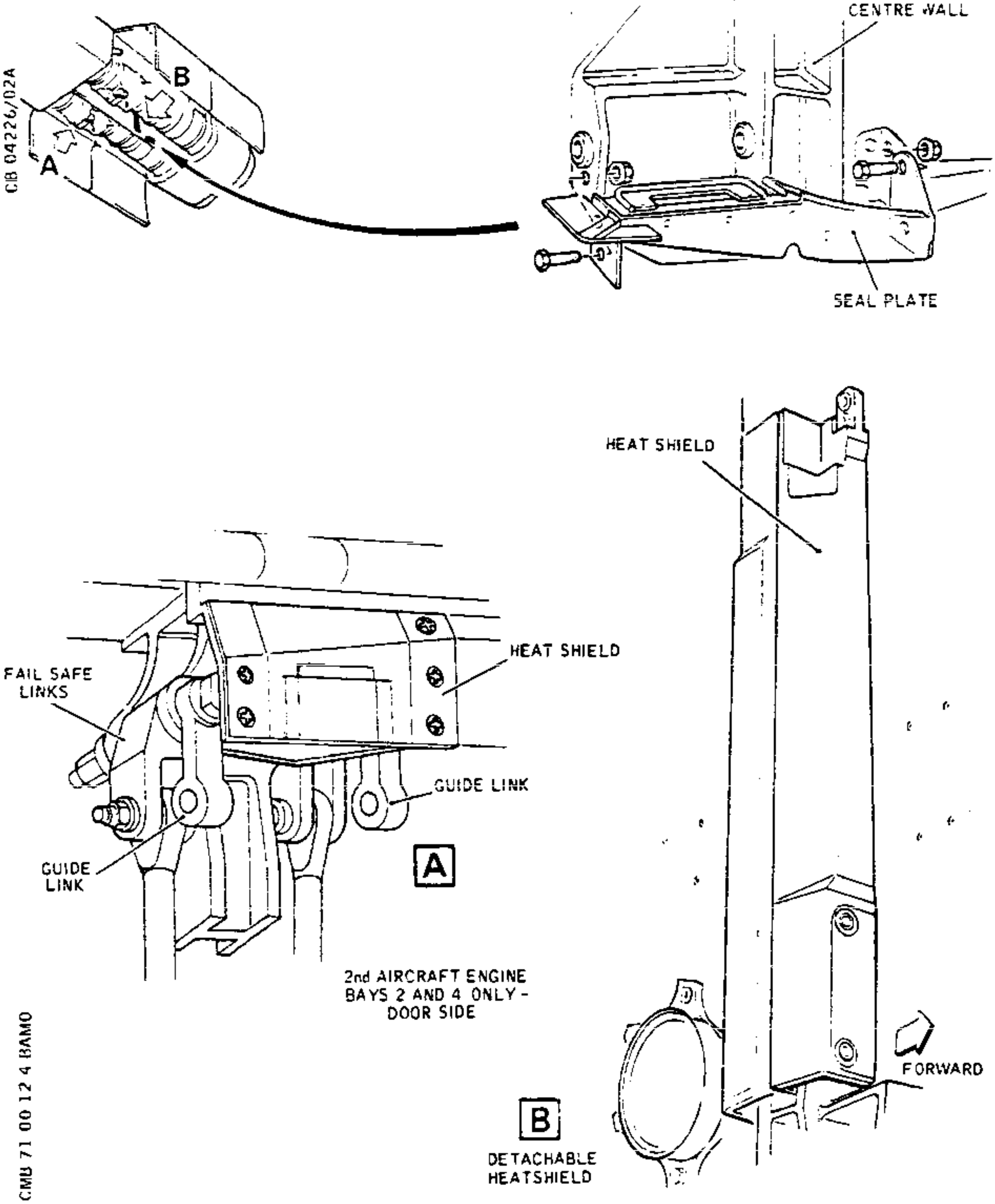
(16) Fit the engine guides to the nacelle, (Ref. Fig.407 and 408).

(a) Install centre wall guides:

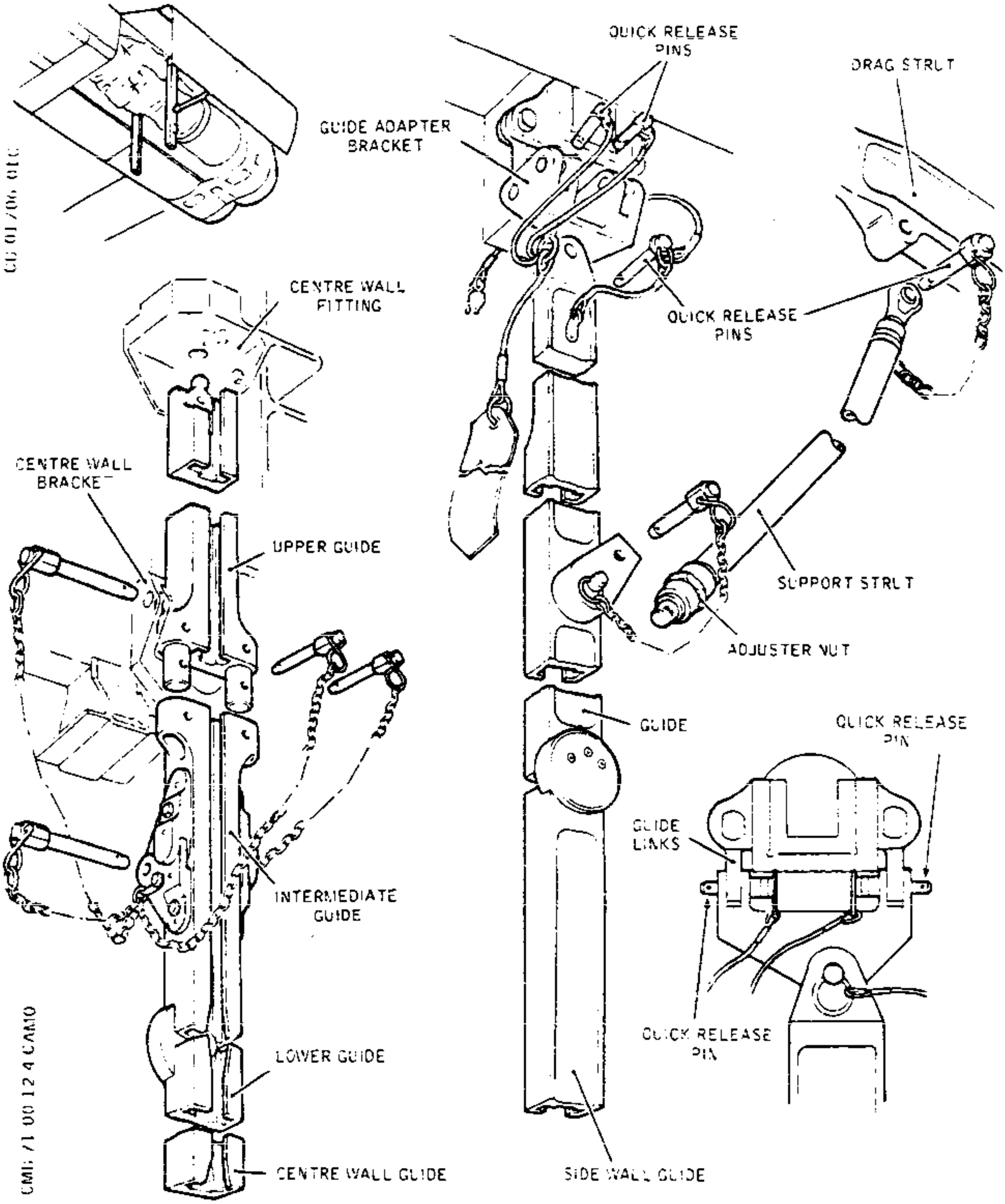
(a1) Remove the seal plate and seal bracket from the base of the centre wall vertical joint and remove the detchable heat shield.

(a2) Engage the upper guide with the engine main mount trolley and slide the guide upward to locate the spigot in the centre wall fitting.

(a3) Fit the intermediate and lower guides to the upper guide; secure them with Pip pins, and secure the assembled guide to the centre wll bracket with a Pip pin. Ensure the hinge between the



Engine Guides
Figure 407



Engine Guides
Figure 408

intermediate and lower guides is held rigidly with a Pip pin.

(b) Install side wall guides:

(b1) Secure the guide adapter bracket to the guide links with the quick-release pins.

(b2) Fit the side wall guide to the adapter bracket and secure it with the pin, lock the pin with the spring clip.

(b3) Fit the support bracket to the drag strut and secure it with a Pip pin.

(b4) Screw the adapter to the support strut.

(b5) Fit the support strut to the support bracket and to the attachment bracket, secure it with a Pip pin.

(b6) Adjust the length of the strut so that the guide is in alignment with the centre wall guide.

(17) Fit the roll adjuster on the underside of the engine (Ref. Fig. 409).

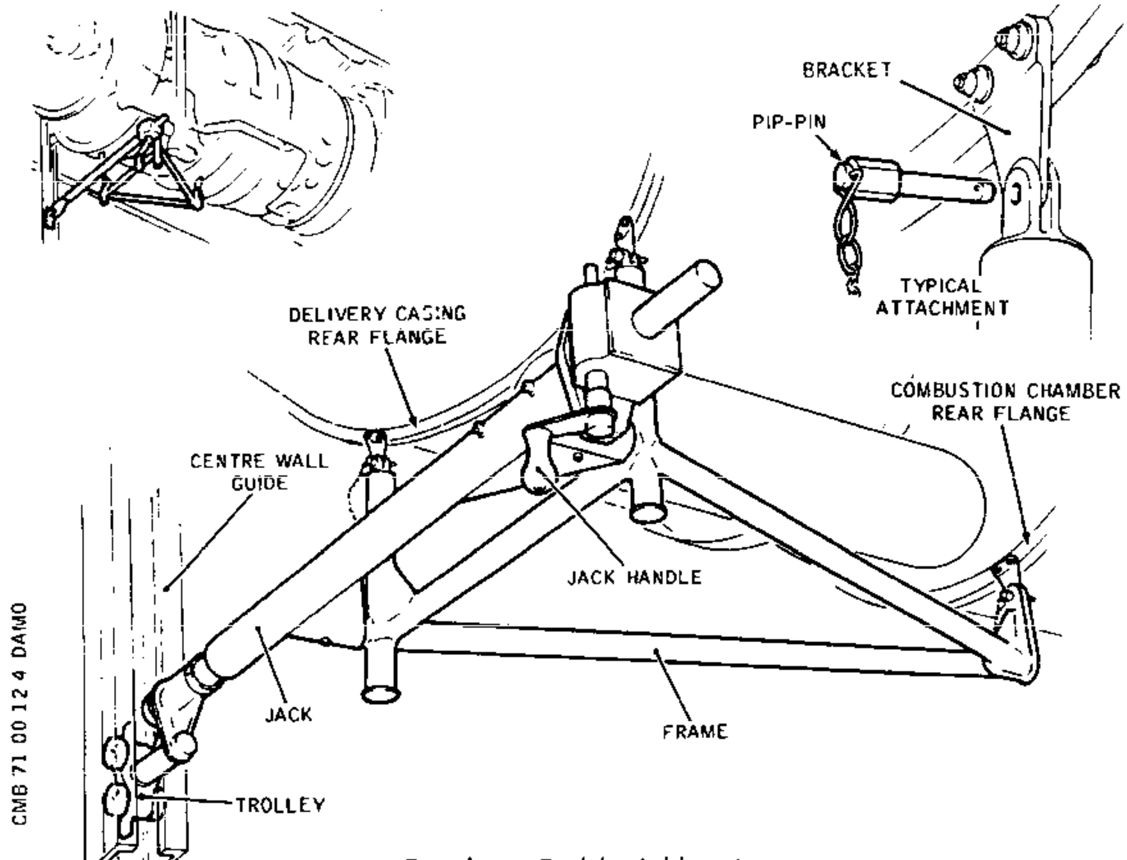
(a) Engage the trolley with the centre wall guide and slide the adjuster upward.

(b) Secure the adjuster frame to the rear flange of the engine delivery casing with Pip pins and to the rear flange of the combustion chamber with a Pip pin.

(18) Make available intercommunication between the engine hoist operator on the wing, and the operator in charge of the engine removal operations (controller).

C. Disconnect Services

CAUTION: FIT BLANKING CAPS TO ALL EXPOSED APERTURES, PIPE ENDS, ELECTRICAL PLUGS AND RECEPTACLES. INSULATE EACH DISCONNECTED ELECTRICAL CABLE. SECURE ALL DISCONNECTED ELECTRICAL CABLES AND FLEXIBLE PIPES IN A POSITION THAT ENSURES NO INTERFERENCE WITH REMOVAL OPERATIONS. ENSURE THAT SUITABLE RECEPTACLES ARE AVAILABLE TO COLLECT SPILLED HYDRAULIC FLUID AND FUEL



Engine Roll Adjuster
Figure 409

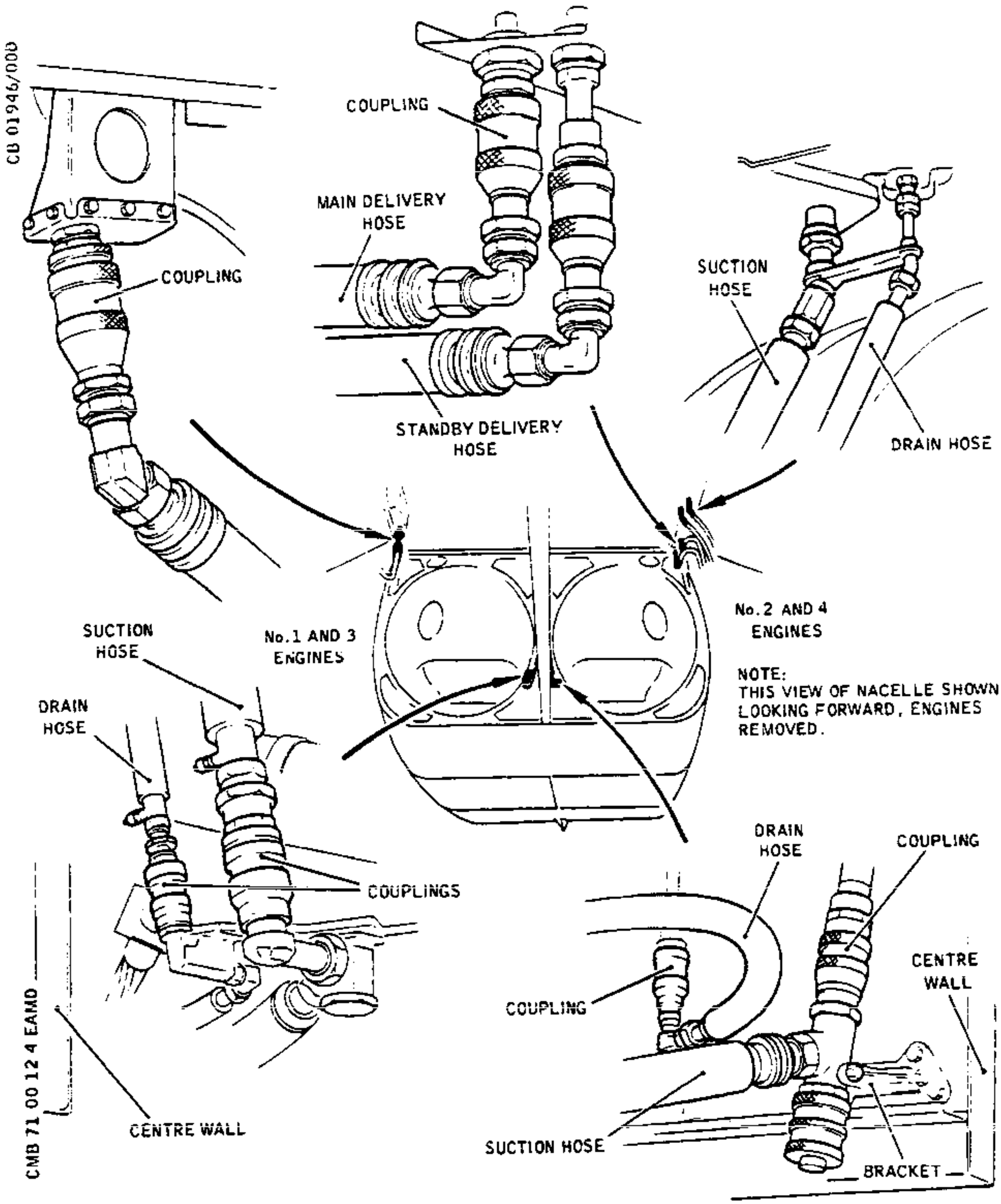
(1) Remove the joint ring connecting the forward end aft intake transition rings. (Ref.71-21-11, Removal/ Installation).

(2) Disconnect the hydraulic connections (Ref. Fig. 410)

CAUTION: WHEN TYING BACK DISCONNECTED FLEXIBLE HYDRAULIC HOSES, DO NOT STRAIGHTEN THE HOSE, MAINTAIN ANY PRE-FORMED RADIUS.

WITH REFERENCE TO THE FOLLOWING OPERATIONS (a2) AND (b2), THESE HYDRAULIC HOSES ARE TOO STIFF TO BE PULLED BY HAND. IT IS THEREFORE NECESSARY TO TAKE THE SPRING FROM THE HOSES BY LOWERING THE ENGINE APPROXIMATELY 1 in (25 mm) BEFORE DISCONNECTING THE SELF SEALING COUPLINGS.

NOTE: TO DISCONNECT THE SELF SEALING COUPLINGS, PULL THE SLEEVE AGAINST SPRING PRESSURE TO RELEASE THE LOCK AND UNSCREW THE OTHER HALF COUPLING.



Hydraulic Couplings
Figure 410

(a) On No. 1 and 3 engines:

(a1) Disconnect the self sealing coupling, mounted on a bracket at the forward edge of the engine bay roof.

(a2) Disconnect the self sealing couplings located on the forward lower section of the nacelle centre wall.

(b) On No. 2 and 4 engines:

(b1) Disconnect the self sealing couplings mounted on the brackets at the forward outer edge of the engine bay roof.

(b2) Disconnect the self sealing couplings located on the forward section of the nacelle centre wall.

(b3) Remove the bolts securing the self sealing couplings to the nacelle centre wall brackets.

(3) Disconnect the hydraulic tank pressurization flexible hose from the associated connection on the engine (Ref. Fig. 411).

(4) Disconnect the electrical services No. 1 and 3 engines (Ref. Fig. 412, 414 and 419).

(a) Remove the bolts and front and rear covers from the forward disconnect box.

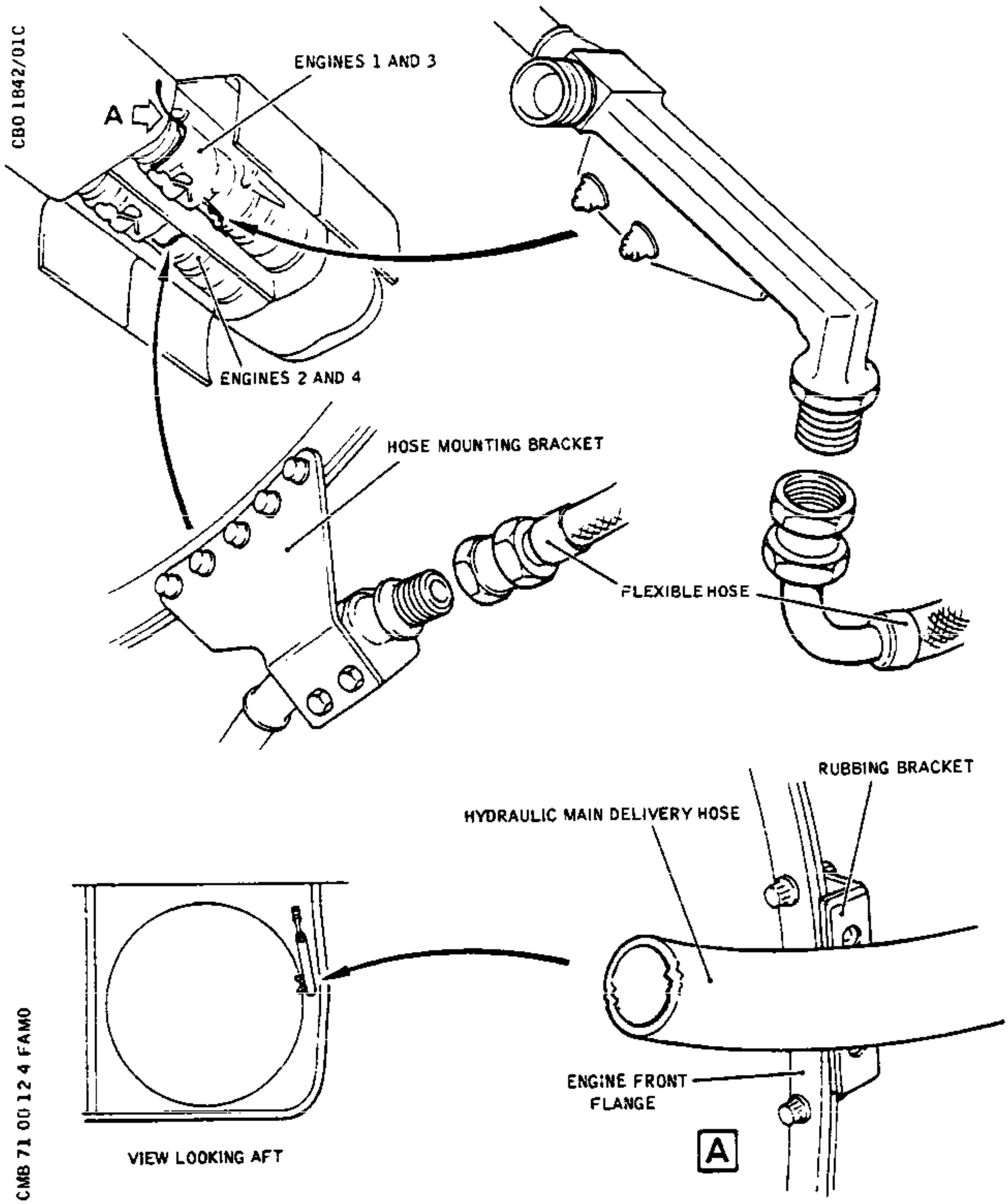
(b) Unscrew and disconnect the electrical plugs B C D E F G and H.

(c) Remove the P-clips securing the HP valve cable to the support tray.

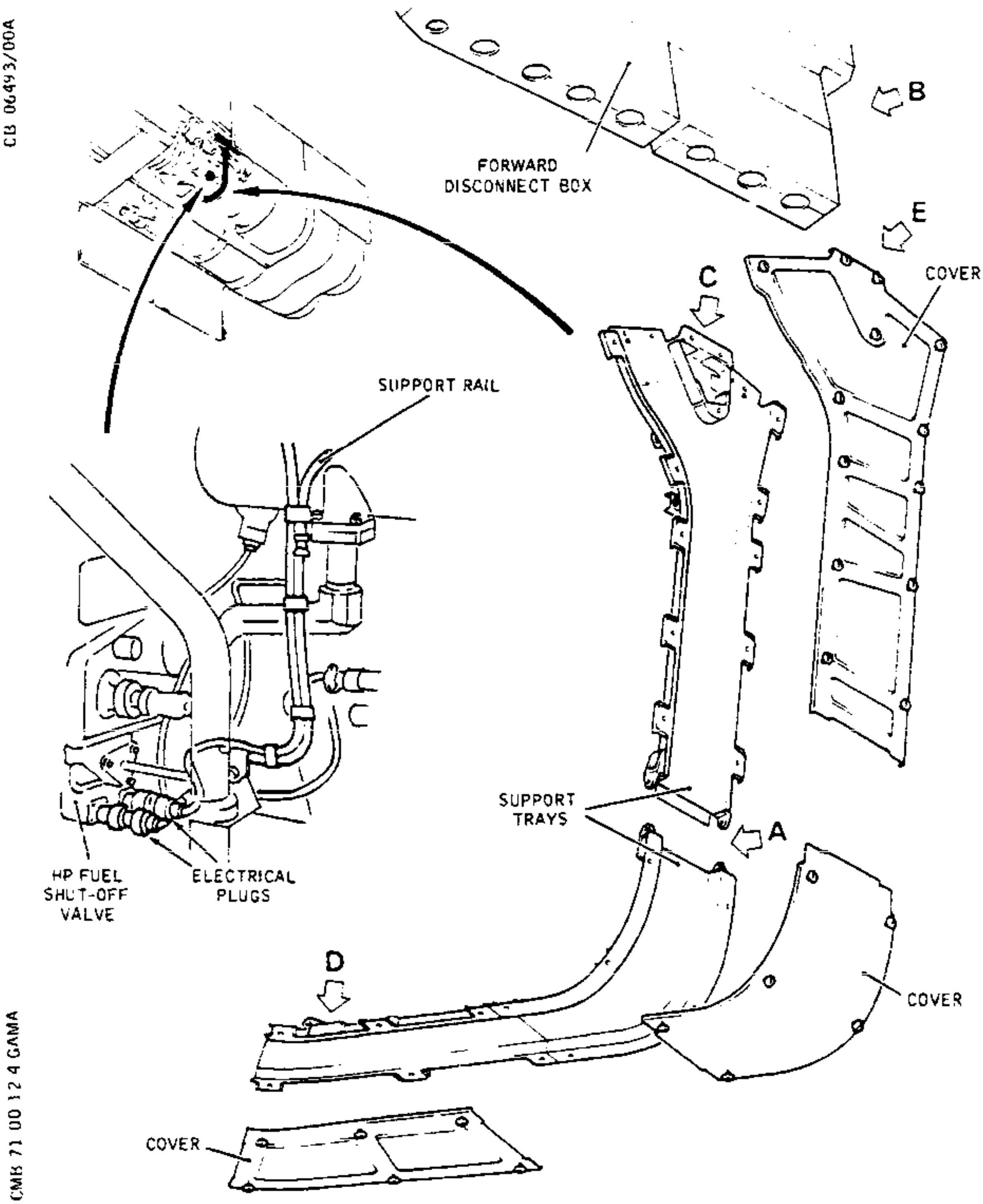
(d) Remove the support tray covers, support the cables, remove the clamp blocks, and disengage the cables from the support tray; temporarily secure the cables to the engine.

(e) Remove the bolts securing the support trays and tie rod to the three brackets.

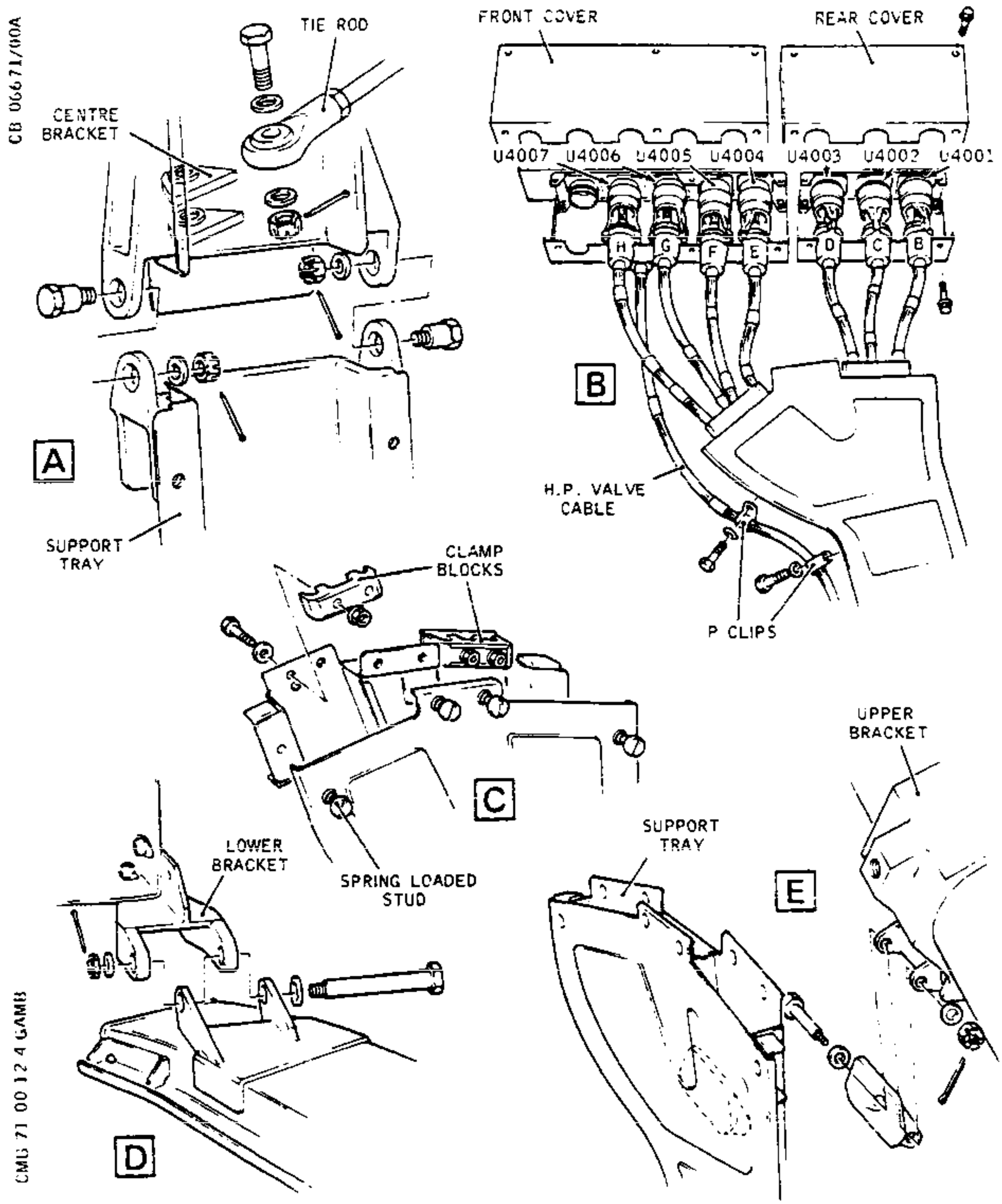
(f) Unscrew and disconnect the two electrical plugs from the receptacles on the HP fuel shut-off valve. Remove the clips securing the electrical



Hydraulic Main Delivery and
Hydraulic Tank Pressurization Pipes
Figure 411



Electrical Connections No. 1 and 3 Engines
(Sheet 1 of 2)
Figure 412



Electrical Connections No. 1 and 3 Engines
(Sheet 2 of 2)
Figure 412

cable to the support rail.

(g) Disconnect the electrical plug marked CON from the receptacle on the generator, also remove the cover and disconnect the connections marked C, B, A and N from the terminals on the generator. Refit the cover (Ref. Fig. 414).

(h) Remove the cover from the thermo-couple junction box and disconnect the terminals from the box. Release the clips securing the cable support rail to the engine. Remove and stow the cable and support rail complete (Ref. Fig. 414).

(j) Remove and stow the jet pipe vibration transducer, when fitted. (Ref. Fig. 419).

(j1) Remove the access cover from the jet pipe heatshield.

(j2) Remove the nut and bolt securing the electrical cable clip to the jet pipe heatshield, allow the clip to hang loose on the cable and refit the bolt and nut.

(j3) Support the transducer assembly and remove the bolts securing the mounting flange to the jet pipe.

(j4) Remove the transducer and mounting flange assembly and secure it to the engine stowage using the captive wing screws provided.

(k) Remove the reheat igniter box (Ref. Fig. 414):

(k1) Disconnect the igniter plug cable from the receptacle on the underside of the reheat igniter box.

(k2) Disconnect the socket from the receptacle on the forward face of the igniter box.

(k3) Remove the nuts and washers securing the igniter box to the centre wall; remove the box.

(l) Remove the flame detection head located above the reheat igniter box (Ref. Fig. 414).

(l1) Disconnect the electrical cable to the

detector.

(l2) Remove the nuts securing the assembly, comprising detector, heat shield and brackets to the centre wall; remove the assembly.

(m) Remove the nut and bolt securing the bonding lead to the bracket located on the rear flange of the engine delivery casing (Ref. Fig. 414).

(5) Disconnect the electrical services No. 2 and 4 engines (Ref. Fig. 413):

(a) Remove the bolts and front and rear covers from the forward disconnect box.

(b) Unscrew and disconnect the electrical plugs B C D E F G and H.

(c) Remove the P-clips securing the generator control cable to the support tray.

(d) Remove the support tray covers, support the cables remove the clamp blocks and disengage the cables from the support tray; temporarily secure the cables to the engine.

(e) Remove the bolts securing the support trays and the tie rod to the three brackets.

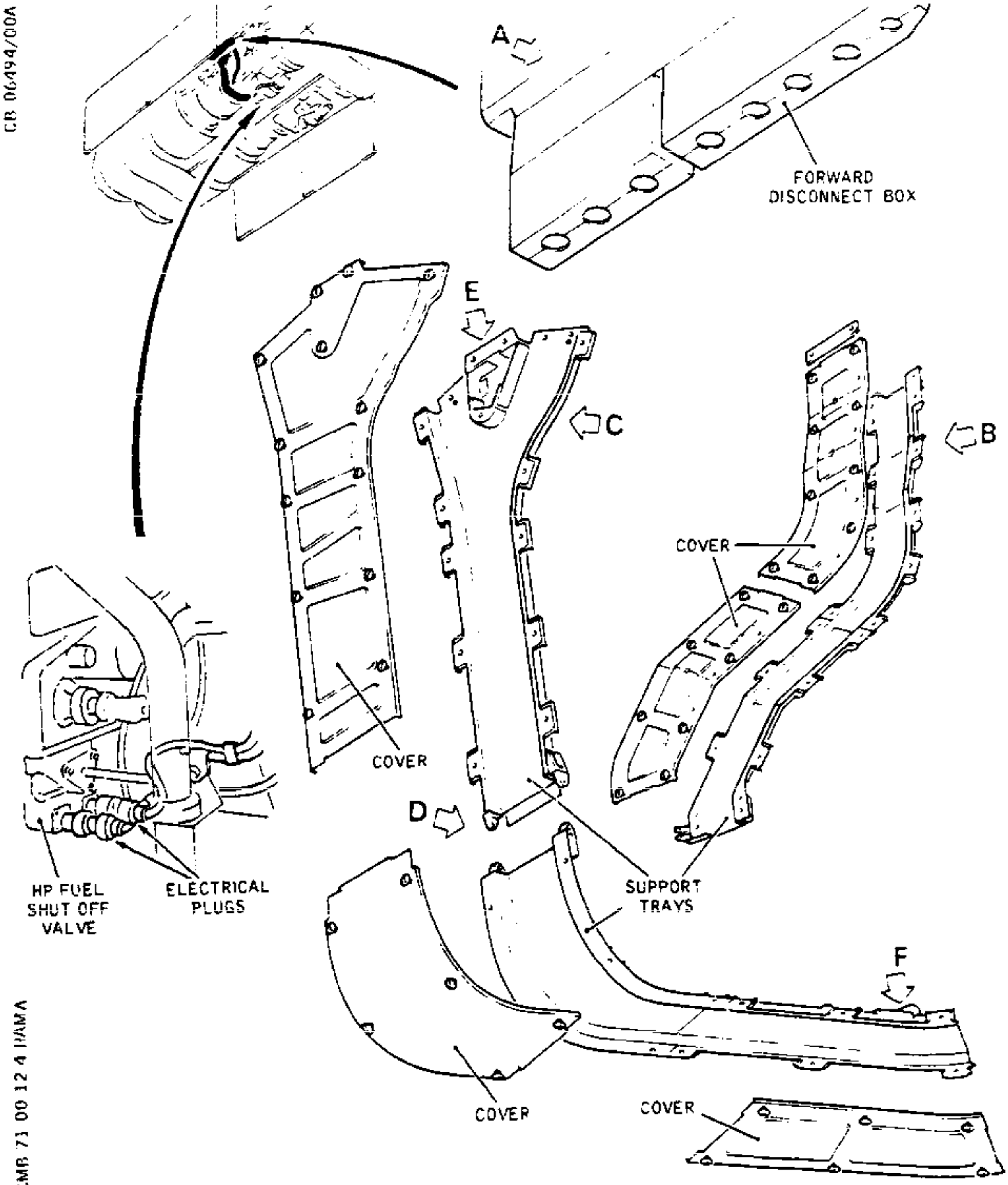
(f) Disconnect the tie rod from the air starter duct support bracket by removing the split pin nut and washer. Loosely replace the washer and nut to retain the bolt.

(g) Remove the bolt securing the upper support tray to the thrust strut bracket.

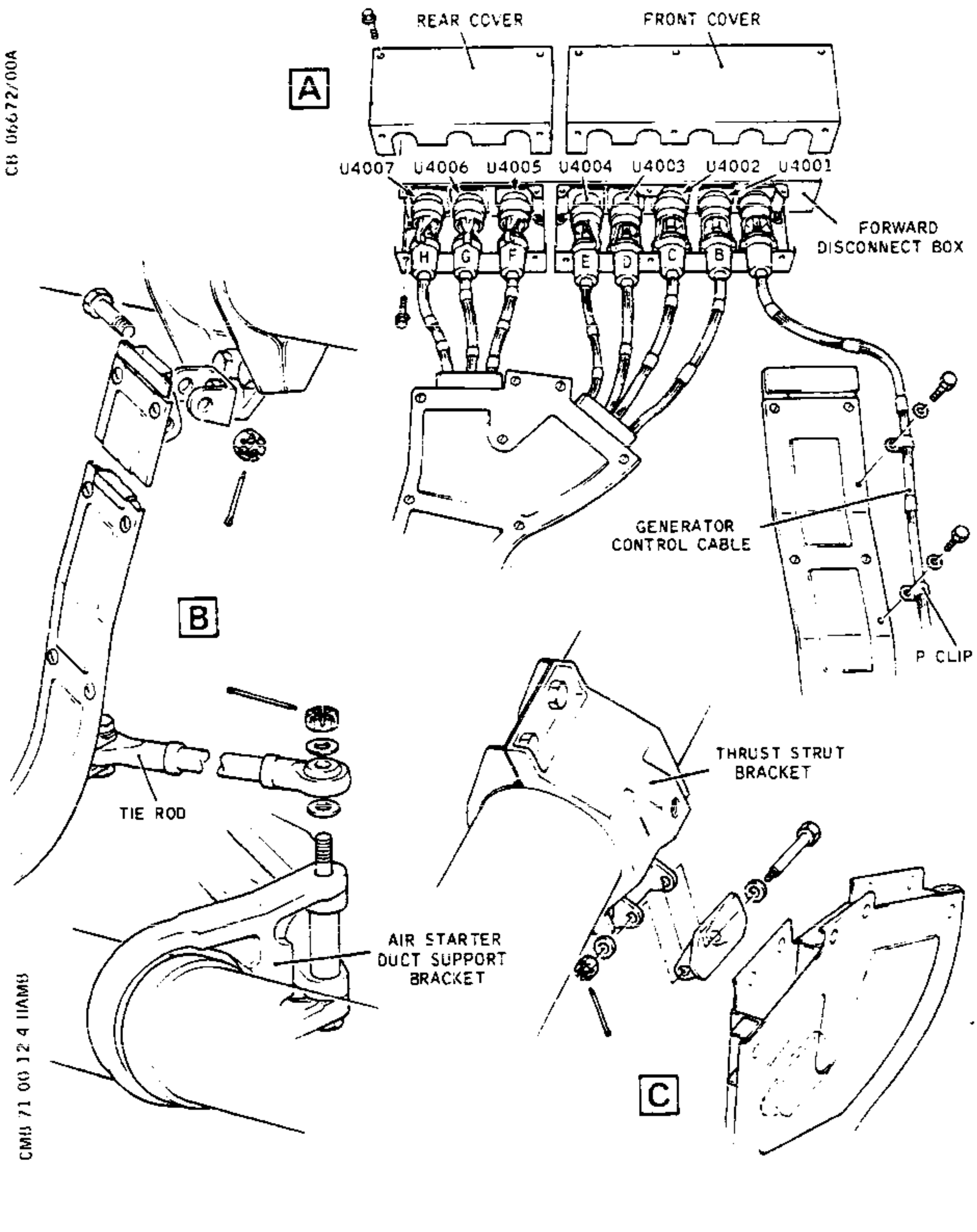
(h) Unscrew and disconnect the two electrical plugs from the receptacles on the HP fuel shut-off valve.

(j) Disconnect the electrical plug marked CON from the receptacle on the generator, also remove the cover and disconnect the connections marked C, B, A and N from the terminals on the generator. Refit the cover (Ref. Fig. 414).

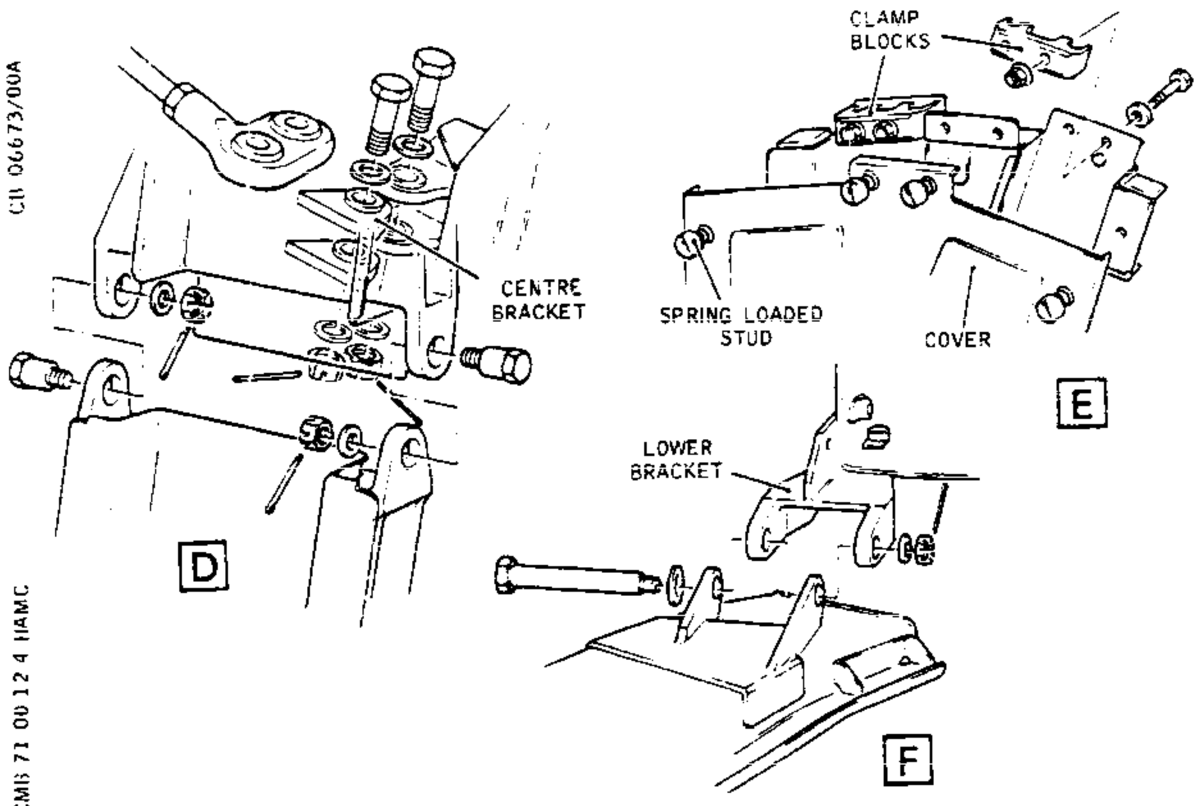
(k) Remove the cover from the thermo-couple junction box and disconnect the terminals from the box. Release the clips securing the cable support rail



Electrical Connections No. 2 and 4 Engines
(Sheet 1 of 3)
Figure 413



Electrical Connections No. 2 and 4 Engines
(Sheet 2 of 3)
Figure 413



Electrical Connections No. 2 and 4 Engines
(Sheet 3 of 3)
Figure 413

to the engine. Remove and stow the cable and support rail complete (Ref. Fig. 414).

(l) Remove and stow the jet pipe vibration transducer (Ref. Fig. 419):

(l1) Remove the access cover from the jet pipe heatshield.

(l2) Remove the nut and bolt securing the electrical cable clip to the jet pipe heatshield, allow the clip to hang loose on the cable and refit the bolt and nut.

(l3) Support the transducer assembly and remove the bolts securing the mounting flange to the jet pipe.

(l4) Remove the transducer and mounting flange assembly and secure it to the engine

stowage using the captive wing screws provided.

(m) Remove the reheat igniter box (Ref. Fig. 414):

(m1) Disconnect the igniter plug cable from the receptacle on the underside of the reheat igniter box.

(m2) Disconnect the socket from the receptacle on the forward face of the igniter box.

(m3) Remove the nuts and washers securing the igniter box to the centre wall; remove the box.

(n) Remove the flame detector located above the reheat igniter box (Ref. Fig. 414):

(n1) Disconnect the electrical cable to the detector.

(n2) Remove the nuts securing the assembly, comprising detector, heat shield and brackets to the centre wall; remove the assembly.

(o) Remove the nut and bolt securing the bonding lead to the bracket located on the rear flange of the engine delivery casing (Ref. Fig. 414).

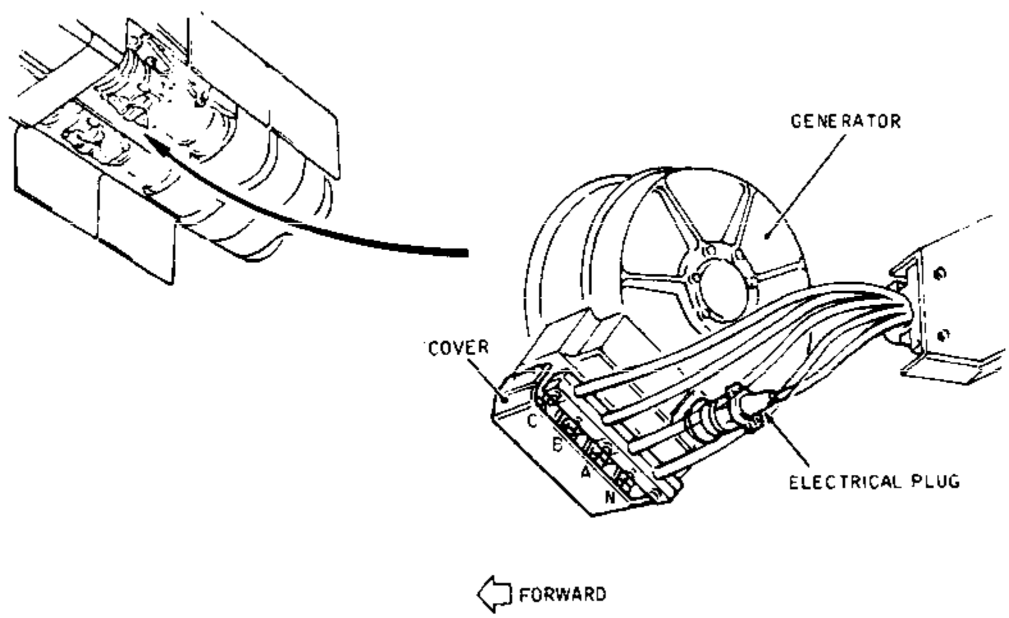
(p) Disconnect the instrumentation plug sockets from the receptacles at the lower front part of the engine.

(6) Disconnect the air cross-feed and air starter ducting (Ref. Fig. 415).

(a) Remove the clamp securing the cross-feed ducting to the intercommunication valve; discard the seals.

(b) Remove the clamp securing te cross-feed ducting to the centre wall coupling; discard the seals. Disconnect the tie rods (No. 1 and 3 engines).

(c) Remove the keep ring (No. 1 and 3 engines), keep plate (No. 2 and 4 engines), securing the starter ducting to the cross-feed ducting; discard the seals.



Electrical Connections (Sheet 1 of 2)
Figure 414

(d) On No. 1 and 3 engines, remove the keep plate from the slider housing on the cross-feed ducting.

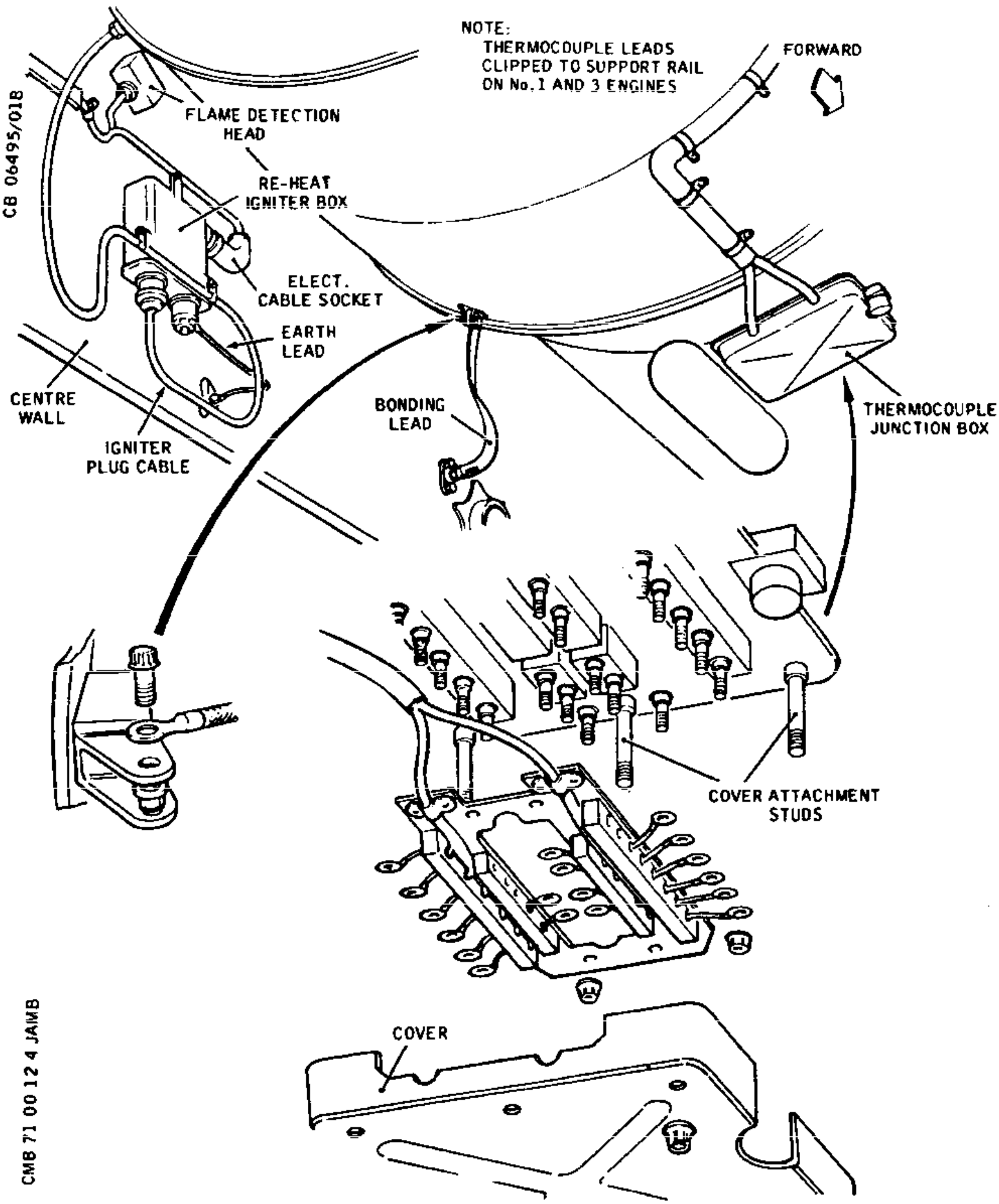
(e) Disconnect the lower mounting on the engine centre line and remove all cross ducting.

NOTE: Operations (a) to (d) must be carried out to free the duct ends, before releasing the lower mountings.

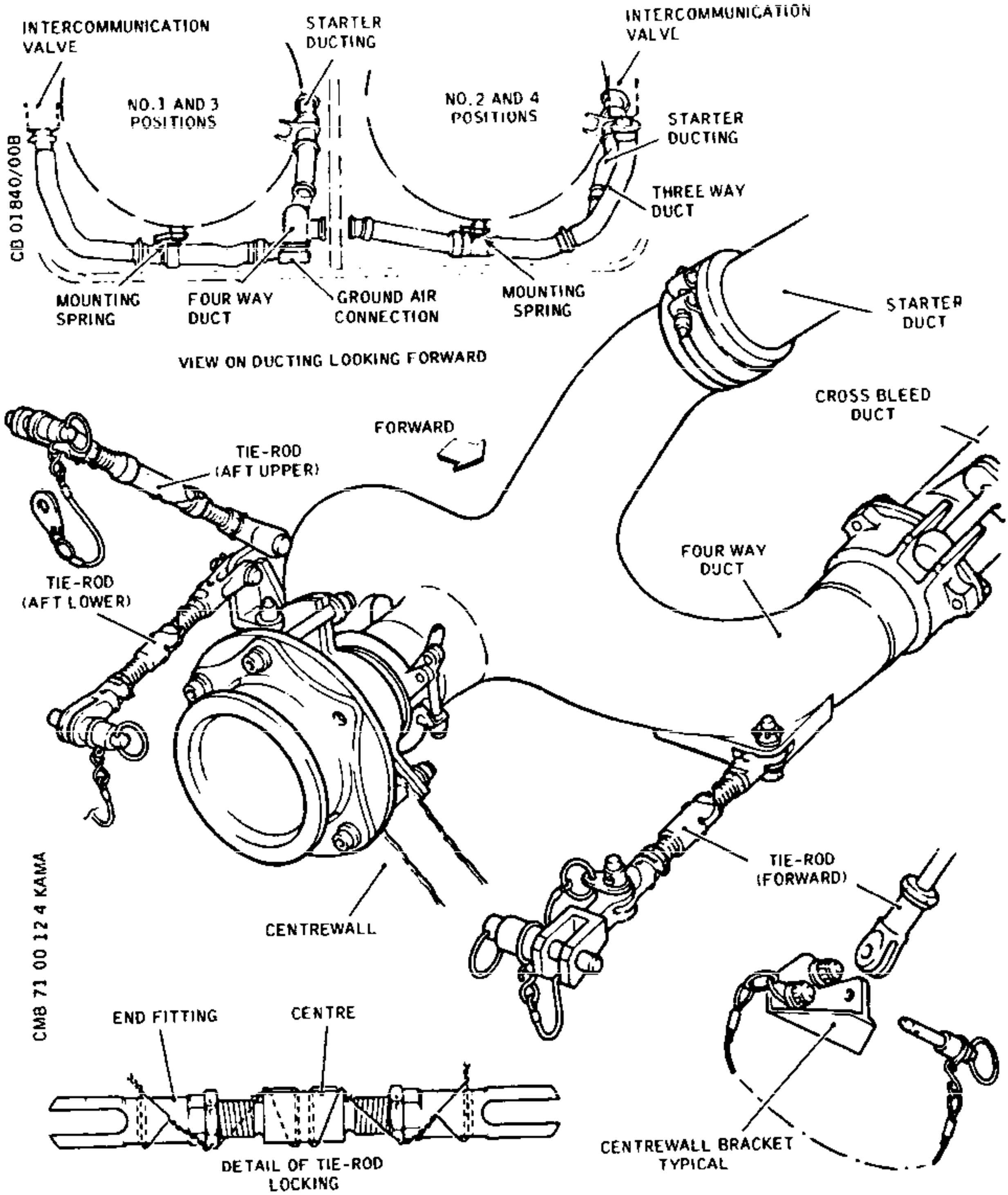
(f) Remove the nuts and special washers from the stator pins securing the duct support struts to the engine casing. Replace nuts on the stator pins.

(g) Unbolt the appropriate fail safe strut and remove the ultra voilet detector from the blanket on the engine main support strut. Tape to the structure out of the way.

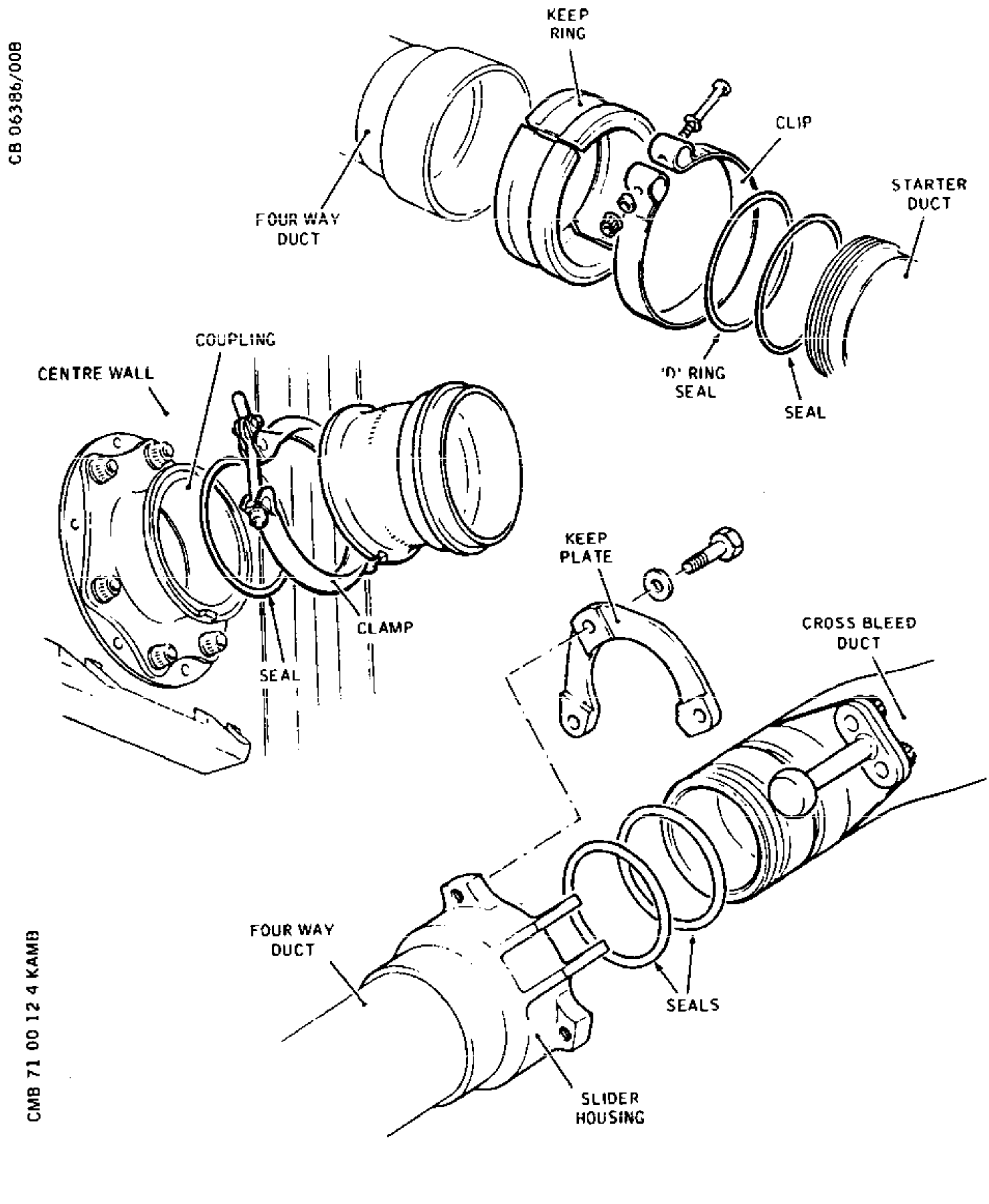
(h) Remove the clamp securing the pipe from the air



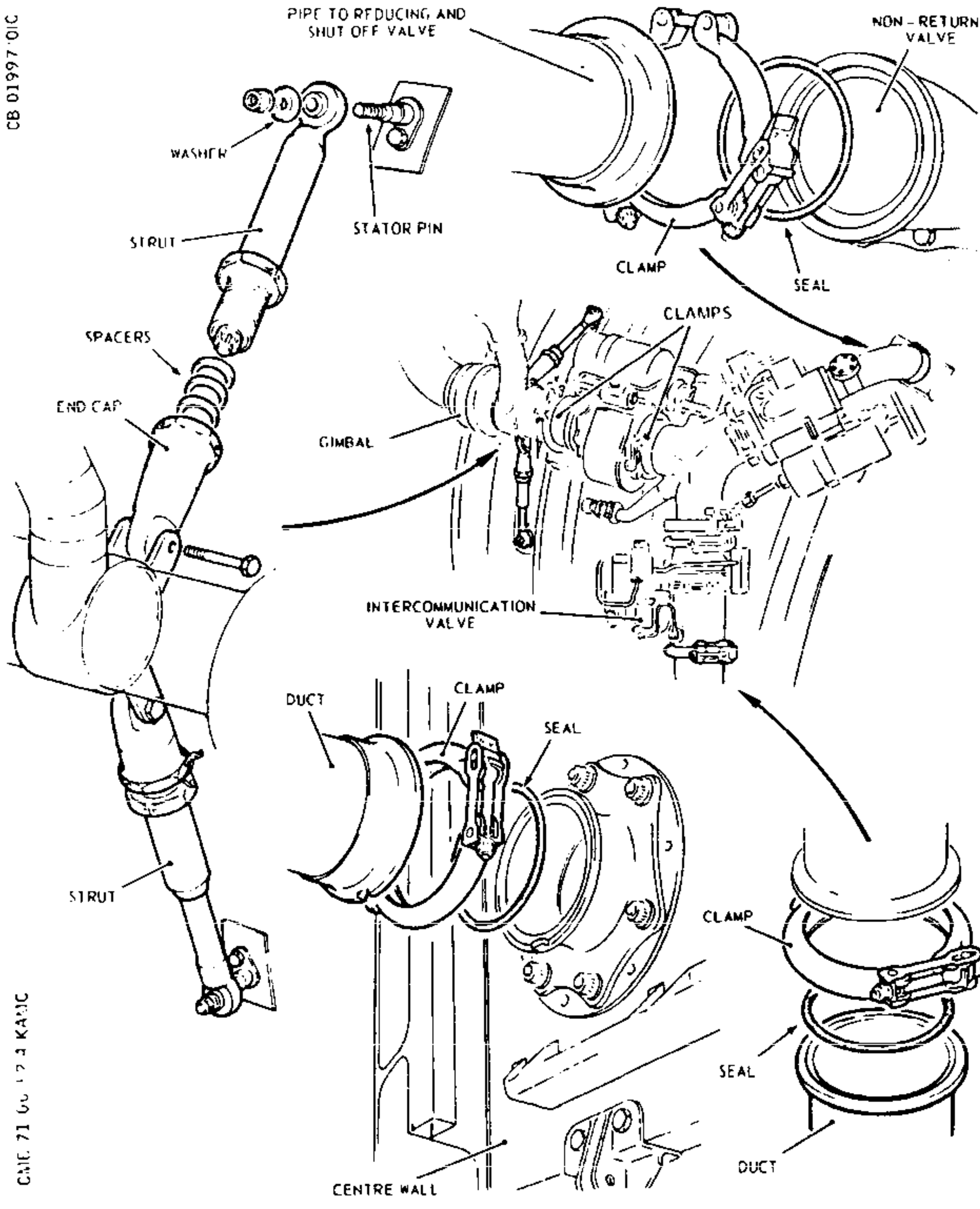
Electrical Connections (Sheet 2 of 2)
Figure 414



Air Starter and Air Conditioning Ducting
(Sheet 1 of 3)
Figure 415



Air Starter and Air Conditioning Ducting
(Sheet 2 of 3)
Figure 415



Air Starter and Air Conditioning Ducting
(Sheet 3 of 3)
Figure 415

conditioning reducing and shut-off valve to the engine non-return valve (Ref. Fig. 415). Discard the seal.

NOTE: After disconnection, the air conditioning valve assembly is supported by a restraint device and may be left in situ.

(7) Disconnect the fuel services (Ref. Fig. 416):

(a) Remove the dust cap from the fuel inlet drain valve and route the hose of the drain assembly to a drain tank.

(b) Screw the drain assembly on to the drain valve, to drain fuel from the feed pipe between the wing mounted fuel shut-off valve and the engine. On completion remove the drain assembly and refit the dust cap.

(c) Remove the clamp securing the feed pipe to the engine connector and discard the seals. Fit a cover to the engine connector.

(d) Disconnect the drain pipes at the banjo connection adjoining the feed pipe engine connector.

(e) Disconnect the recirculation pipe:

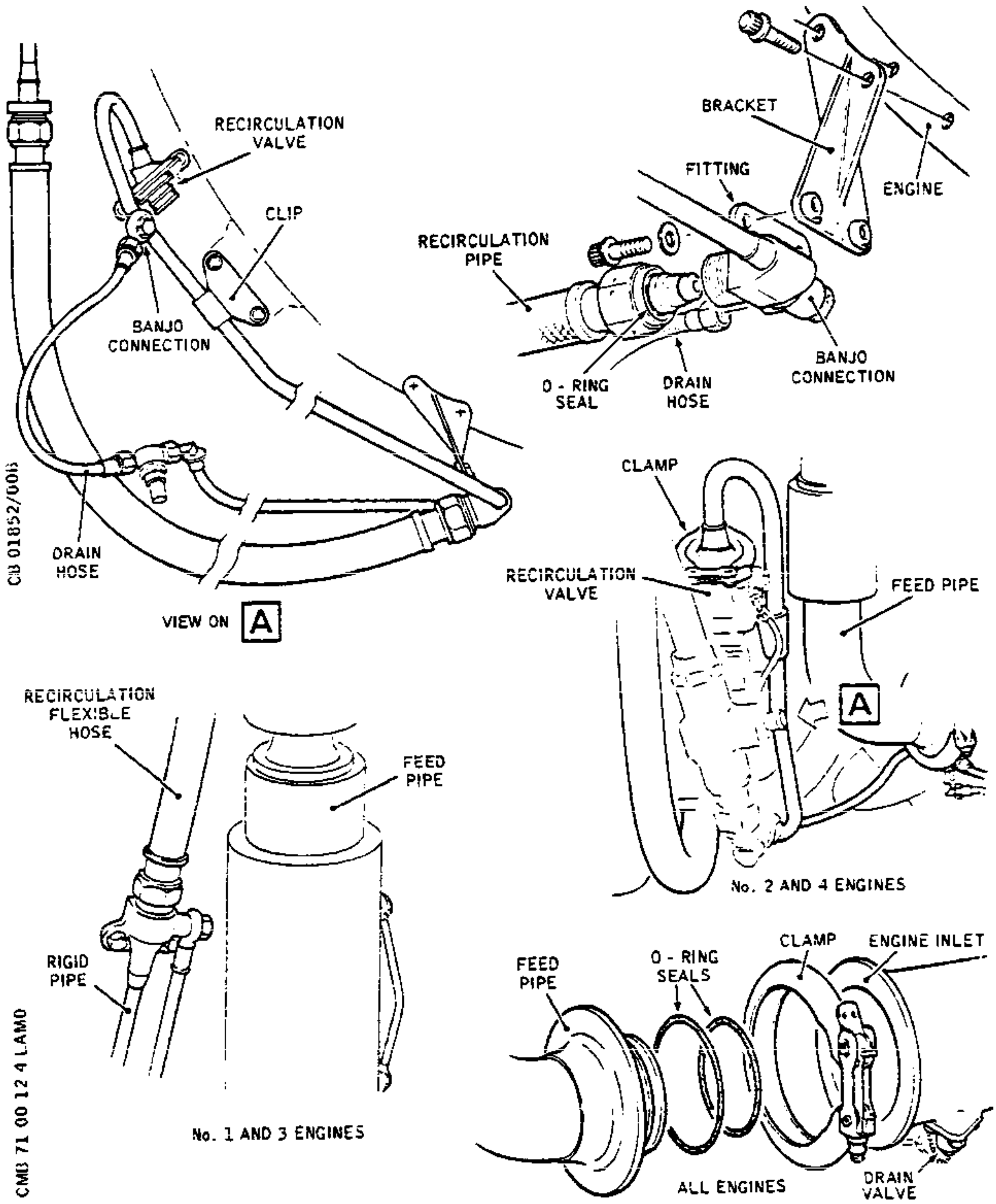
(e1) On No. 1 and 3 engines, disconnect the flexible hose at the upper end of the engine mounted pipe.

(e2) On No. 2 and 4 engines, disconnect the flexible pipe from the union at the bracket.

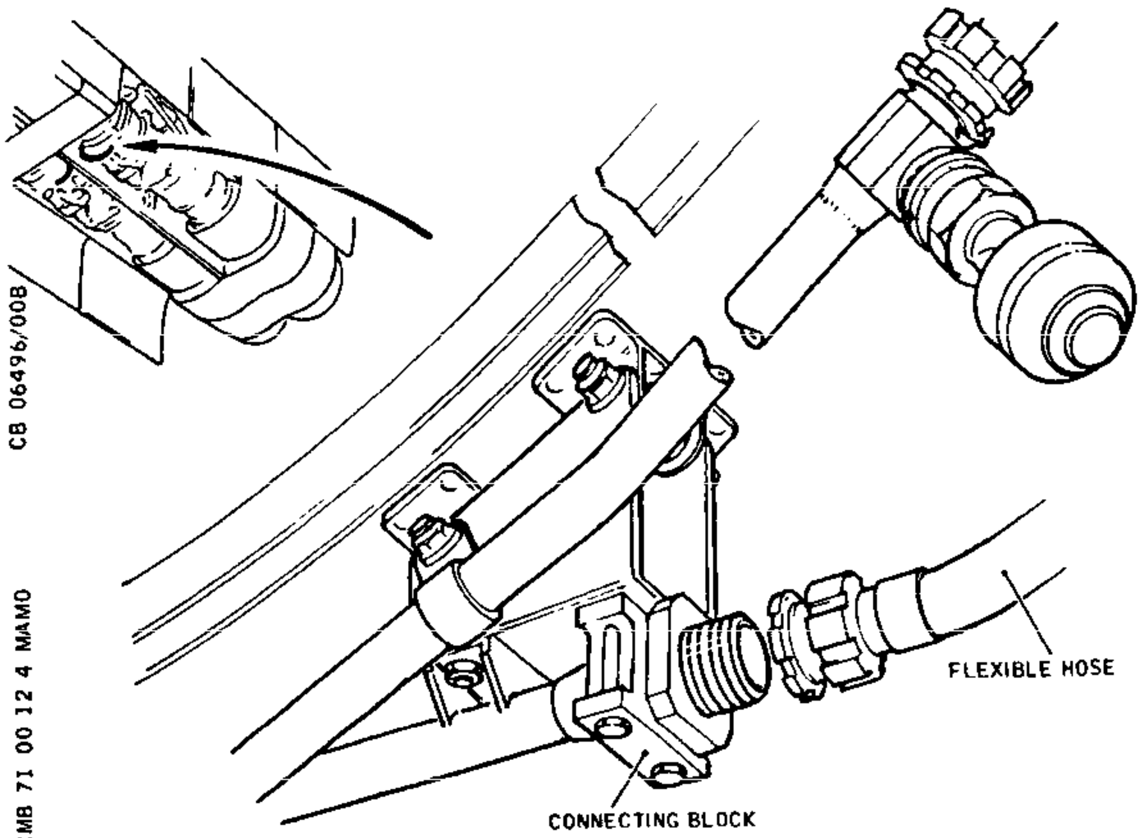
(8) Disconnect the fire extinguisher flexible hose, from the pipe mounted on the underside of the rear transition ring adjoining the nacelle centre wall (Ref. Fig. 417).

(9) Disconnect the pneumatic pipes from the engine bay centre wall and the engine diffuser (Ref. Fig. 418):

(a) Disconnect the PNC and PJ signal flexible hoses from the connections on the centre wall.



Fuel Connections
Figure 416



Fire Extinguisher Connections
Figure 417

(b) Disconnect the flexible P3 pipe to the reheat igniter, at the pipe elbow.

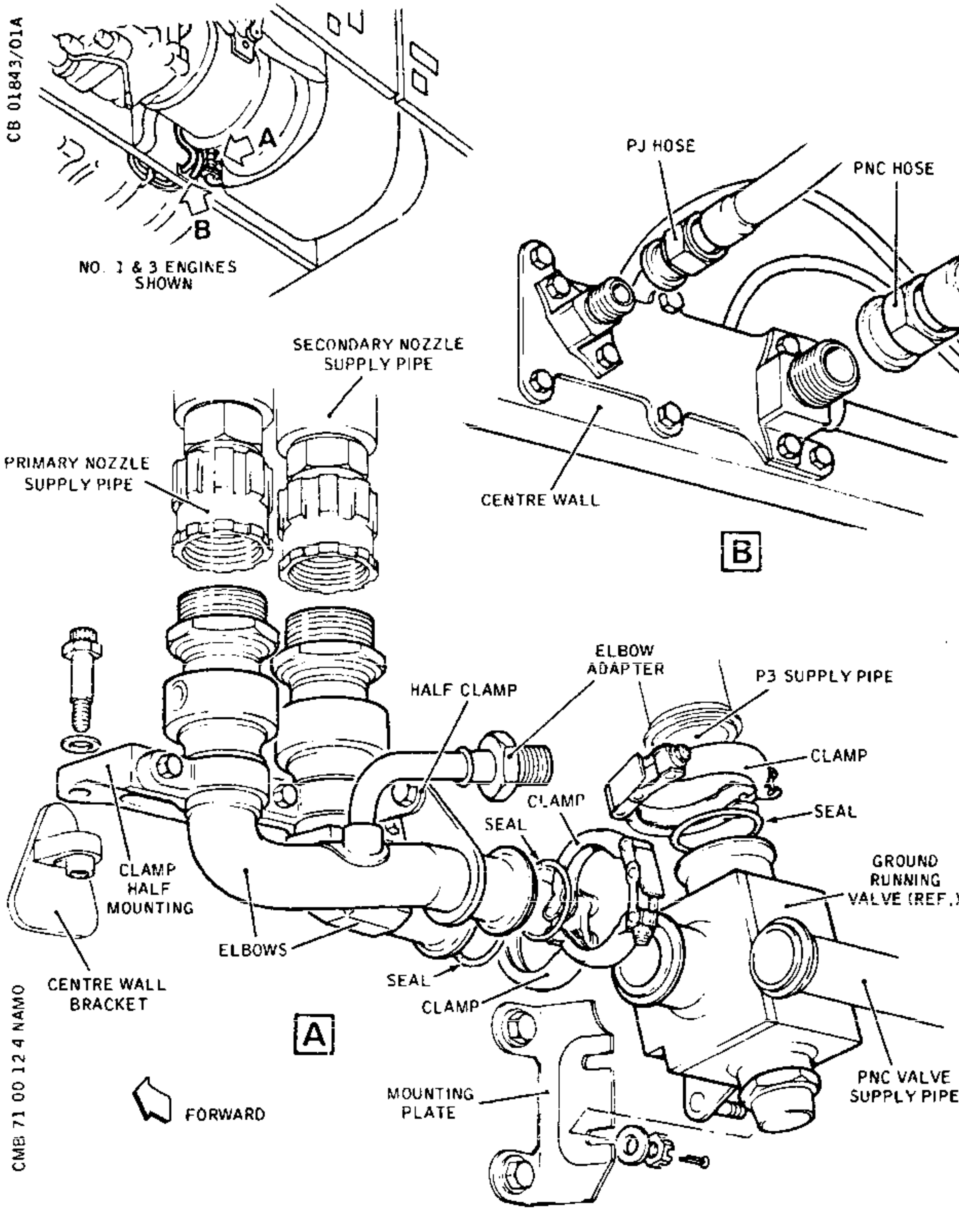
(c) Disconnect the primary and secondary nozzle supply pipes at the pipe elbows on the centre wall.

(d) Remove the clamps securing the pipe elbows to the PNC valve supply pipe and the ground running valve. Discard seal.

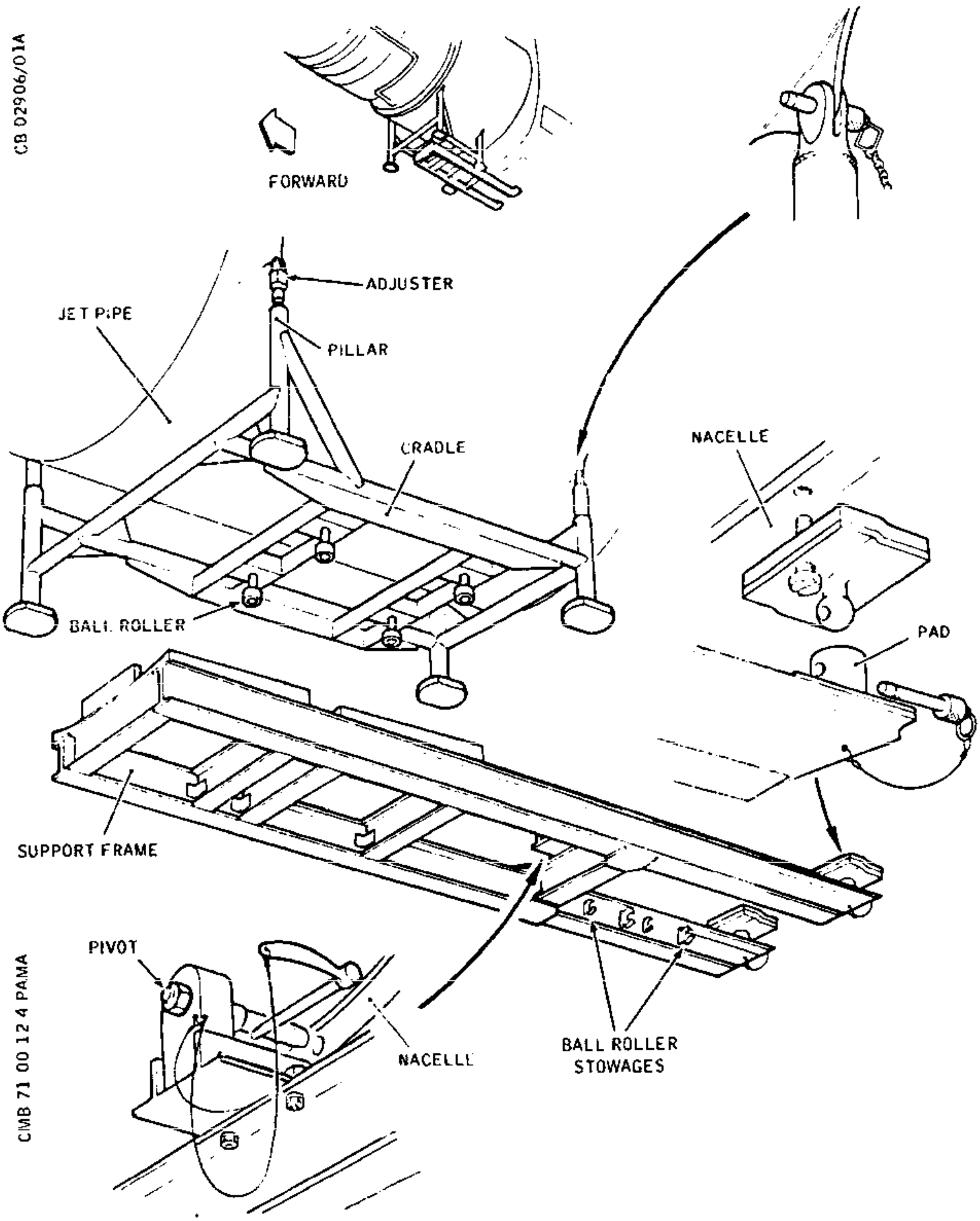
(e) Remove the bolts securing the clamp half to the clamp half mounting on the centre wall; remove the elbows.

(f) Remove the bolts securing the clamp half mounting to the centre wall brackets.

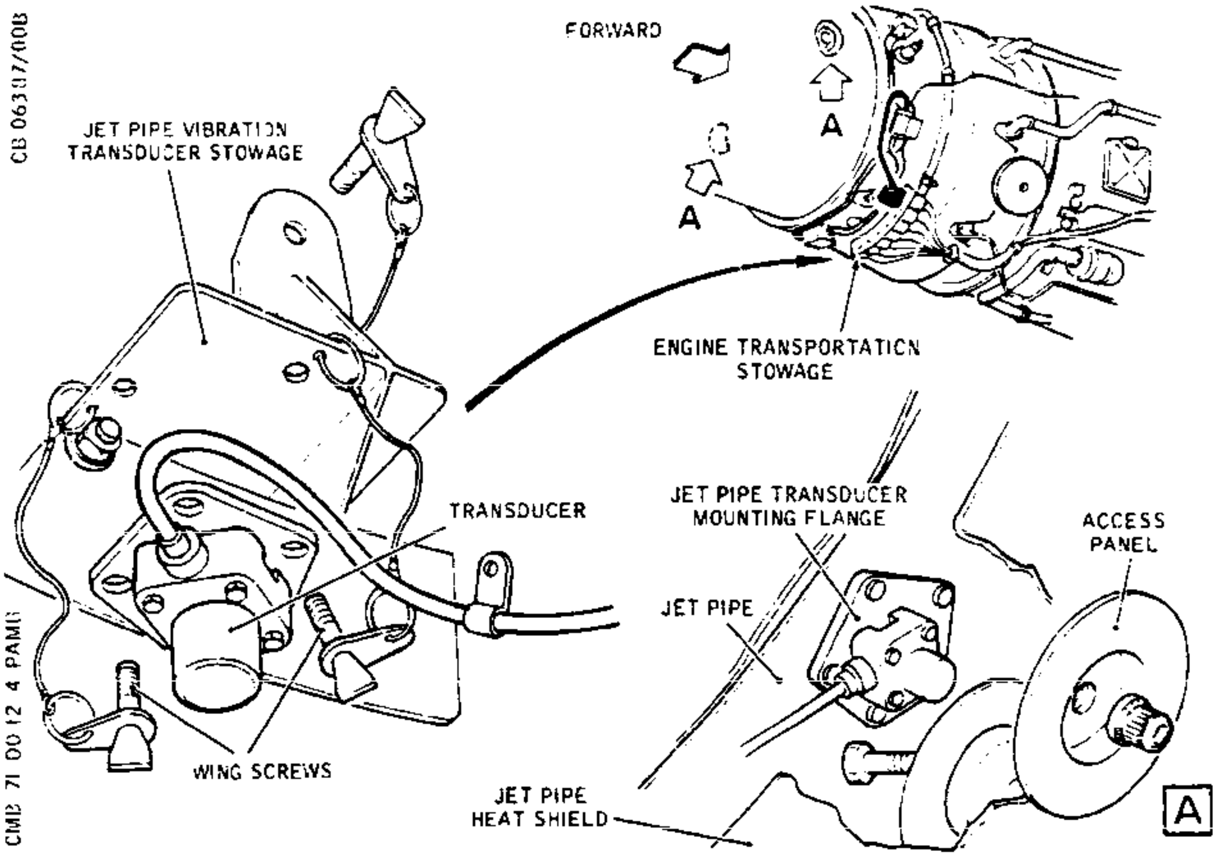
(g) Remove the clamp securing the ground running valve to the P3 supply pipe, remove the ground running valve from the centre wall bracket, discard the seals.



Pneumatic Connections.
Figure 418



Jet Pipe Installation and Connections
(Sheet 1 of 3)
Figure 419



Jet Pipe Installation and Connections
(Sheet 2 of 3)
Figure 419

(10) Disconnect the flexible drain hose from the rigid pipe on the underside of the jet pipe (Ref. Fig. 419).

(11) Disconnect the power indicator flexible pipe from the engine adapter (Ref. Fig. 419).

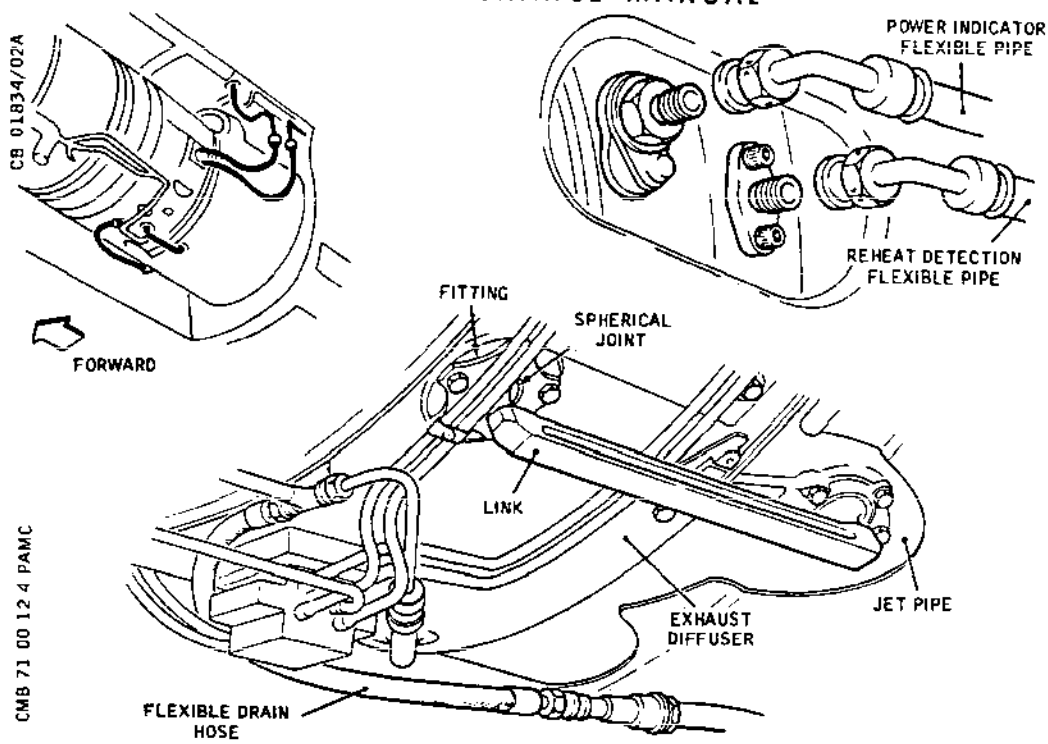
(12) Disconnect the reheat detection flexible pipe from the engine adapter (Ref. Fig. 419).

(13) Disengage the jet pipe from the engine exhaust diffuser (Ref. Fig. 419):

(a) Support the cradle beneath the jet pipe and secure it to the jet pipe with Pip pins.

NOTE: The length of one cradle pillar is adjustable.

(b) Remove the ball rollers from the stowed



Jet Pipe Installation and Connections (Sheet 3 of 3)
Figure 419

position on the support frame and screw them fully into the cradle.

(c) Secure the pivot and the pad to the nacelle structure with a Pip pin and a bolt.

(d) Secure the support frame to the pivot and pad with Pip pins.

(e) Unscrew each ball roller until it is in contact with the support frame; continue to unscrew each roller another 10 turns after initial contact.

(f) Remove the bolts and washers securing the jet
RB pipe link to the exhaust diffuser. Insert two of
RB the removed bolts into the 'redundant' holes of
RB the spherical housing flange. Tighten lightly
RB and alternately against the diffuser case so
RB gently forcing the spherical housing flange away
RB from the engine mating surface. Gently percuss
RB from within the jet pipe to completely free the
RB connecting link from the exhaust.

RB CAUTION: DO NOT ATTEMPT TO LEVER THE SPHERICAL
RB HOUSING AWAY FROM THE ENGINE AS
RB DAMAGE WILL RESULT.

RB (g) Discard bolts and washers. Thoroughly clean threaded holes and visually examine link (Ref. 78-11-01 P/B 600). Check security of link to jet pipe. If any securing bolts are corroded, missing etc, renew all bolts and washers.

R (h) Slide the jet pipe rearwards.

D. Remove Engine

B WARNING: 1. CHECK HYDRAULIC RESERVOIR HAS SUFFICIENT OIL LEVEL.

B 2. CHECK ELECTRIC BRAKE PLUNGERS ARE FREE.

B 3. CHECK RATCHET IS OPERATING.

B 4. CHECK CABLES ARE CORRECTLY LOCATED IN PULLEY VEES.

B 5. DURING LOWERING OPERATIONS CONTINUOUSLY MONITOR THE LOAD ON THE HOIST CABLES BY WATCHING THE DIGITAL DISPLAY ON THE PENDANT REMAINS EQUAL FOR THE FORWARD AND AFT CABLES. IF A HANG-UP OCCURS STOP LOWERING AND SLIGHTLY RAISE THE APPROPRIATE CABLE UNTIL THE DISPLAY INDICATES THE CABLE HAS BEEN LOADED AGAIN BEFORE INVESTIGATING THE CAUSE OF THE HANG-UP.

B CAUTION: PHYSICALLY CHECK CABLE TENSIONS.

NOTE: It is considered that six operators (minimum) are necessary to ensure that engine lowering operations are completed without damage to the engine or the engine bay. These operators are to be stationed as follows: One (controller) at ground level controlling lowering operations. One on top of the wing disconnecting front mounts and spigot, fitting guide bullets and watching clearances. One at each of the engine guide positions to check the progress of the engine rollers in the guides. One in the engine air intake to check for obstructions. One to check for obstructions at the engine exhaust area.

A minimum length of 1.5 turns of each cable must encircle the cable drum with the hoist cables fully extended.

(1) Engage the forward and rear engine hoist cable and bearings with the engine lifting brackets and secure each cable end to the bracket with a pin, lock each pin with a spring clip, align and lower the locating collar onto the pin handle (Ref. Fig. 421).

(2) With no load on the hoist cables check the load cell readings are zero on the pendant digital display. As required adjust to zero on the forward and aft potentiometers at the base of the trolley electric box. (Ref. 71-00-12 P/B 1-100 Fig. 005).

(3) Take up the slack in the cables until both digital displays read 100% (- 3% approx.).
Equal cable tensions can be obtained by adjusting the front hoist beam adjustable leg up or down as required.

(4) Disengage the engine mounts (Ref. Fig. 420).

(a) Actuate pendant switch UP SLOW and increase aft cable tension to 115% and then fwd. tension to 115% taking weight off engine mounts.

(b) Remove the nut securing the restraint spigot bearing, to the wing structure (Ref. Fig. 420) and fit the bullet.

(c) Disconnect each of the engine forward mounts (Ref. Fig. 420 and 426):

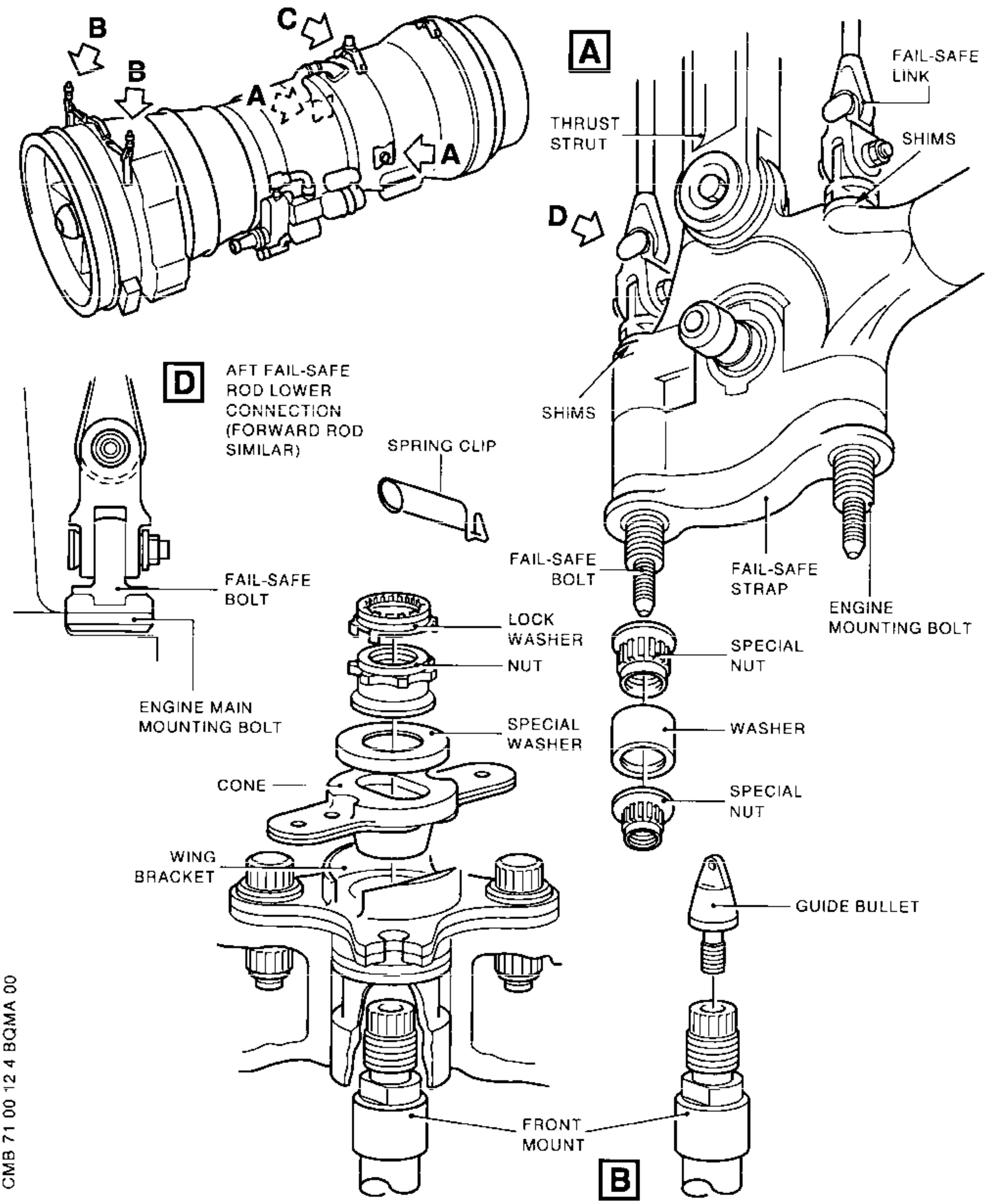
(i) Remove the spring clip from the mount.

(ii) On the lock washer extractor, unscrew the bolt until it is retained on the extractor, then screw the extractor on the lock washer; turn the bolt to withdraw the lock washer from the mount splines. Remove the extractor complete with the washer.

(iii) Remove the washer and cone from the mount.

(iv) Fit bullets and bullet guide wires. An operator controlling the hoist must keep tension on the guide wires.

(d) Remove the special nuts and washers securing the main engine mounts and remove the fail safe straps.



CMB 71 00 12 4 BQMA 00

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R

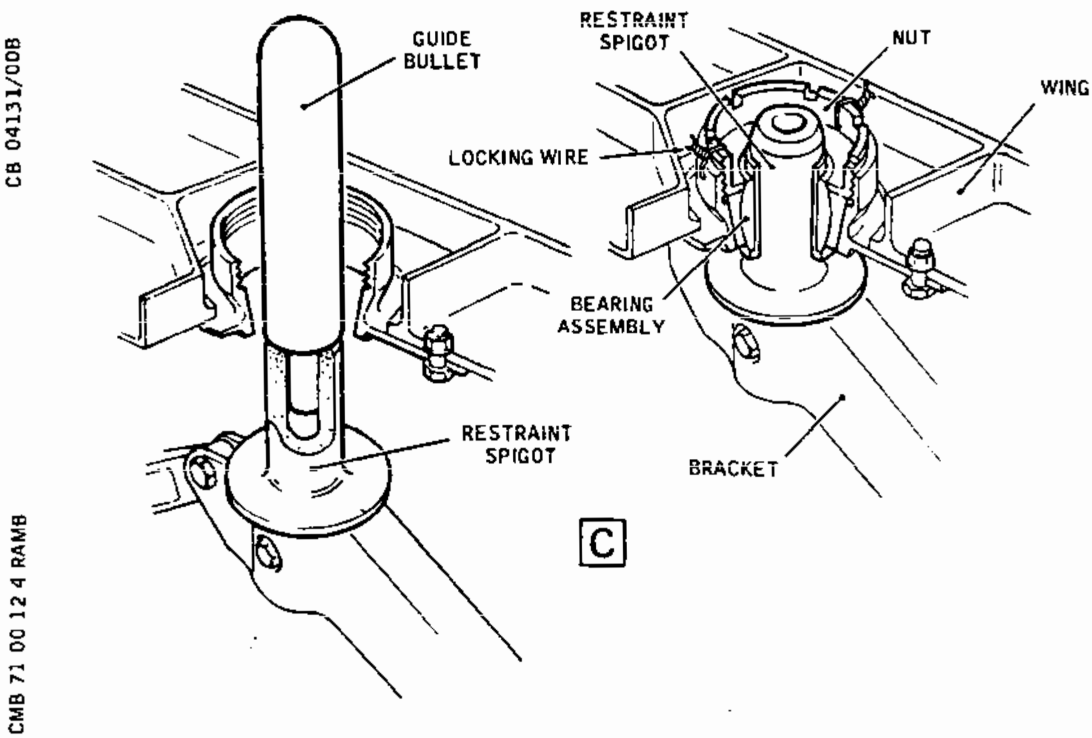
Engine Mounts (Sheet 1 of 2)
Figure 420

B (5) Turn the jack handle on the roller adjuster until it is loaded towards the nacelle centre wall (Ref. Fig. 409).

B (6) Lower the engine.

B Adjust the hoist forward leg so that the engine is
B tilted 1 deg. 35 mins, nose down relative to aircraft
B longitudinal datum; measure this angle with a
B clinometer placed on the forward face of the rear
B transition ring.

CAUTION: WHEN LOWERING NO.2 AND 4 ENGINES, OPERATE THE ROLL ADJUSTER TO MOVE THE TOP OF THE ENGINE OUTBOARD, SO THAT THE ENGINE OIL TANK REMAINS CLEAR OF THE HYDRAULIC PIPE ASSEMBLY LINK. WHEN THE ENGINE HAS BEEN LOWERED SUFFICIENTLY ADJUST THE ANGLE OF THE ENGINE CENTRE LINE SO THAT IT IS PARALLEL WITH THE CENTRE WALL GUIDE.



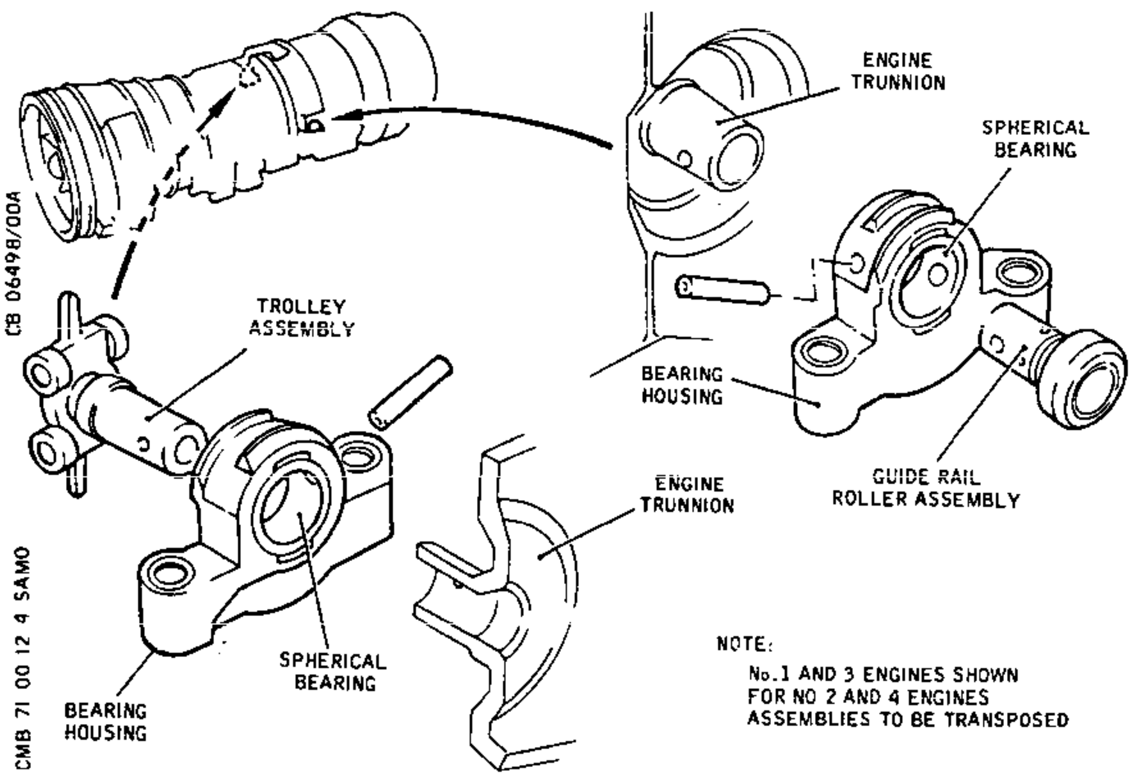
Engine Mounts (Sheet 2 of 2)
Figure 420

(a) Select DOWN SLOW.
Check during operation that both load control read outs show approximately 95% to 96% (aft reading usually higher).
If one reading shows 80% or under this means engine jamming, hoist will stop. To correct this situation, depress switch UP SLOW and RESET simultaneously until jamming is eliminated as shown on read out.
STOP hoist - depress DOWN SLOW to further lower engine. Refer to C. (2) CAUTION para 2. regarding the disconnection of hydraulic hoses.

(b) Stop lowering after the engine has been lowered approx. 18 in. (457.2 mm).

(c) Fit the forward and rear cable fairleads by unhooking the fairlead retaining cable and engaging each fairlead with its recess in the wing bottom skin.

(7) Continue to slowly lower the engine until the roll adjuster and the main mounts are clear of the guides. Pendant read out can be 92%-93% when engine clear of nacelle.



Engine Trunnions
Figure 421

(8) Support the roll adjuster, and remove the Pip pins securing the adjuster to the engine; remove the adjuster (Ref. Fig. 409).

(9) Remove the side wall support strut and the guide from their brackets (Ref. Fig. 408).

(10) Disconnect the lower and intermediate centre wall guides from the upper centre wall guide by removing the Pip pins.

(11) Position the engine layby/installation trolley as accurately as possible under the engine.

(12) Remove the main mounts from the engine trunnions (Ref. Fig. 421):

(a) Rotate each bearing housing on the engine trunnion until the pin is visible.

B (b) The pin P/No.E51129310000 should be removed from
B the bearing housing using the bolt and tube
B assembly shown in Figure 416A. If the extraction
B bolt shears on removal, remove the bolt stub with
B an Easy-Out and drill and tap pin to next size up
B in accordance with Table A to existing depth of
B hole. (EN 5958).

B NOTE: The extractor will be made available in
B loan tool stores but until this occurs
B local manufacture should be carried out
B when necessary.

	BOLT SIZE	BOLT O/D	TAP DRILL
B	10-32	192	.161
B	1/4 - 28	250	.216
B	5/16 - 24	313	.272
B	3/8 - 24	375	.330

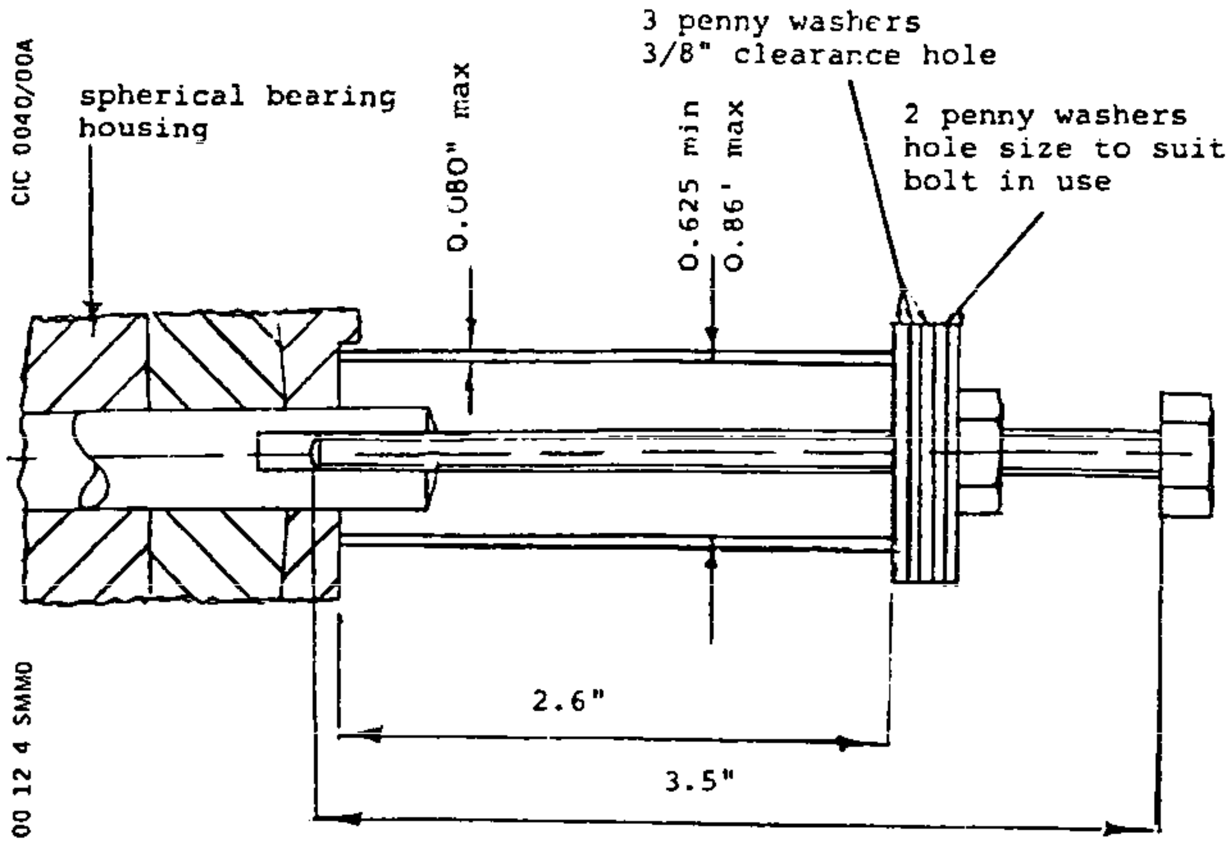
B TABLE 'A'

B (13) Secure the engine into the layby/installation trolley and disconnect the engine hoisting cables (Ref. Fig. 423):

(a) Slide an engine stand bush over each engine trunnion.

(b) Lower the engine into the trolley; secure the mounting caps over the bushes with hand nuts (Detail B).

CIC 0040/00A



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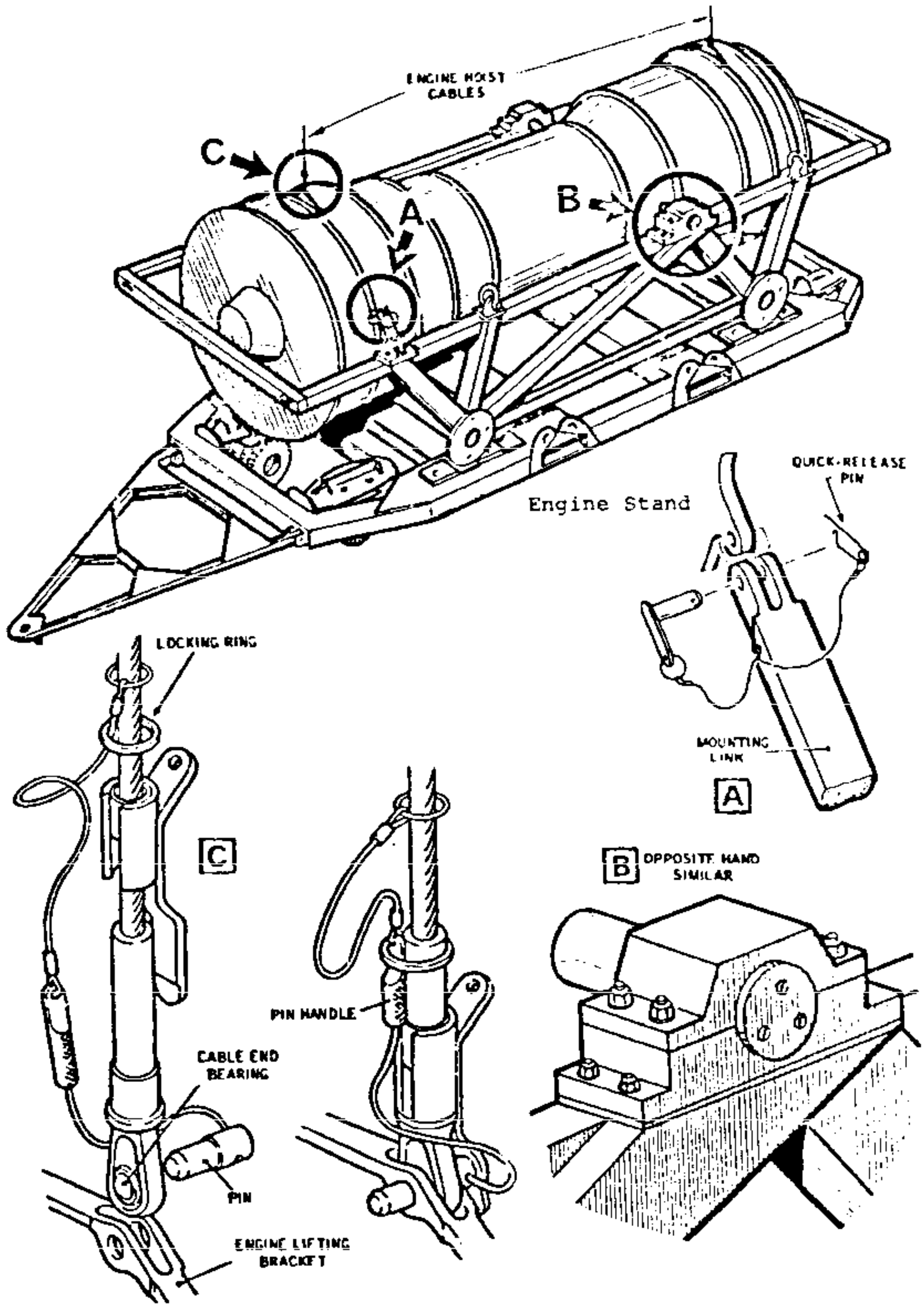
Pin Extraction
Figure 422

B

CIC 0041/00A



CMB 71 00 12 4 TAFO

Engine Transport Stand LG11381
Figure 423

B

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(c) Secure the forward mounting pillars to the engine brackets with Pip pins.

(d) Remove the hoisting cables from the engine (Detail A), and the bullets from the mountings.

(14) Fit the cover over the engine exhaust diffuser, check the security of the engine intake cover, and ensure that all apertures, pipe ends, electrical plugs and receptacles are covered.

(15) Move the trolley clear of the aircraft.

(16) With a minimum load of 11.05 lb (5 kg) on each hoist
R B cable operate the hoist control button to "UP" until the cables are clear of the working area.

(17) Remove the restraint spigot bearing assembly from the wing structure (Ref. Fig. 420).

3. Inspection/Check Following Engine Removal

NOTE: In addition to an overall visual Inspection/Check of the engine bay for damage and security of parts, the following specific checks must be made.

A. General

(1) Check Tantalum/Durestos heatshields in the area indicated (Ref. Fig. 424).

NOTE: Where damage is found, also check the stainless steel surface of the underwing firewall immediately above the damaged area.

If the stainless steel surface of the firewall is penetrated a complete inspection of the wing above is required.

R After SB 71-076

R (2) Replace any damaged temperature sensitive wires on the firewire sidewall plate in accordance with 71-32-17

R (3) Check Hydraulic/Fuel Pipe Articulated Clamp (Ref. Fig. 425).

(a) Inspect the fuel recirculation and case drain pipes for signs of chafing or damage from the heads of the articulated linkage pivot bolts.

NOTE: Incorporation of SB 71-064 changes the pivot bolt hexagon heads for countersink heads and inverts the articulated linkage to provide greater clearance to eliminate chafing.

(b) Check the assembly of the articulated clamp which must not move on the pipes

(c) Check the distance from the upper pipe clamp to the lower pipe clamp (Ref. Fig. 425) and rectify as necessary. Torque tighten the clamp bolts to between 25 and 30 lbf in (0.28 and 0.34 mdaN).

R (4) On the engine, check the security of the nozzle vane abutment segment bolts (Ref.OLY SB 593-72-8632-206).

After SB 26-014 For A/C 003-003, 006-006

R (5) Carry out a spare sensing element test as detailed in 26-11-00 Adjustment/Test.

All Aircraft

(6) Carry out a detailed inspection of the avionic installation visible in the engine bay.

(7) Carry out a detailed visual inspection of the air conditioning ducting, sense lines and starter ducting for fretting by the engine casing and nacelle structure.

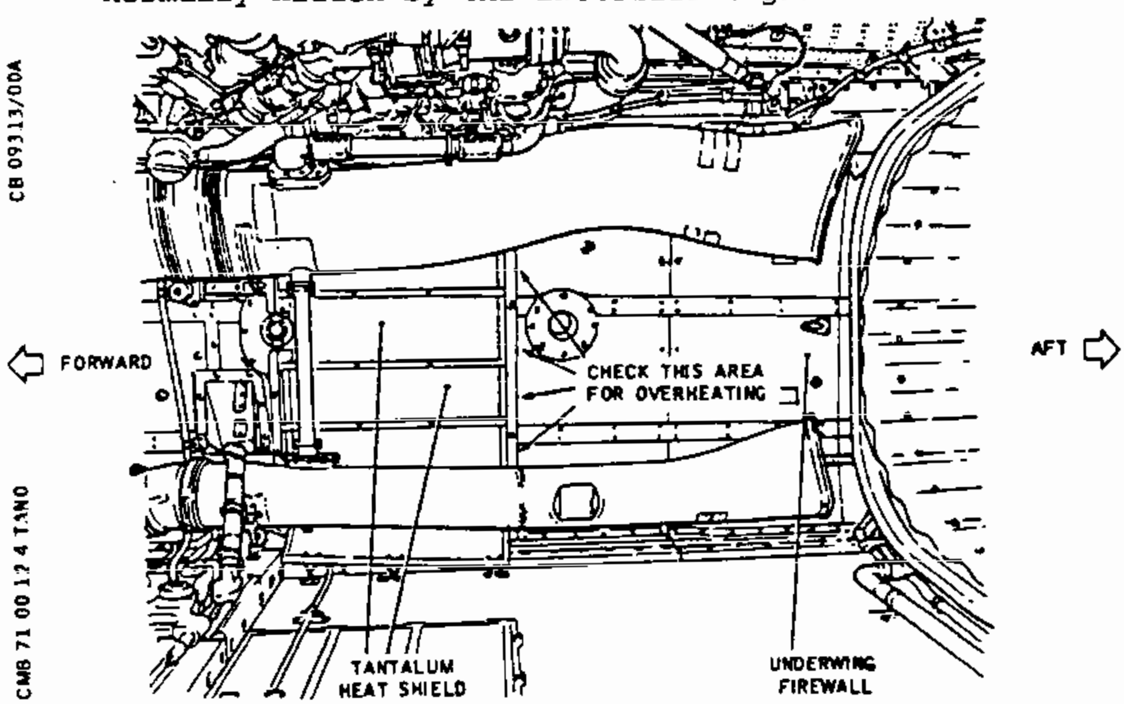
(8) Visually inspect engine mount lateral restraint at spar 68.

(9) Visually inspect underwing firewall panels (Ref. 71-32-11).

(10) With air doors open visually inspect secondary air ducts and doors.

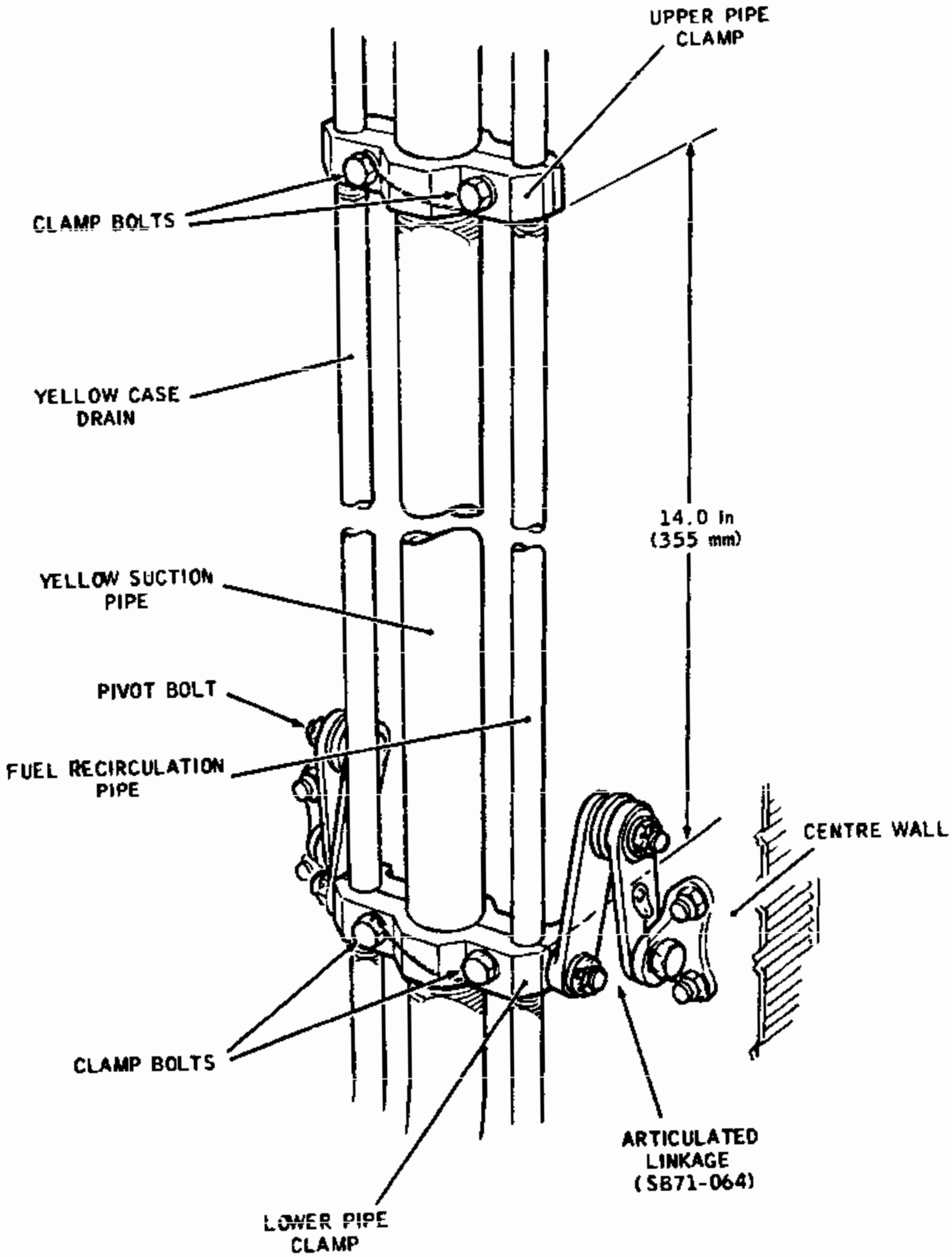
(11) Carry out a surveillance inspection of all serviceable engines that have either been removed for access and will be fitted in the same bay, or engines subject to robbery action.

(12) Carry out a surveillance inspection of the engine bay normally hidden by the installed engine.



Underwing Heatshields Inspection
Figure 424

CB 09266/00B



CMB 71 00 12 4 TAPO

Adjustment of Articulated Linkage Clamp.
Figure 425

4. Engine - Installation

A. Prepare to Install Engine

NOTE: Remove the inlet guide vane fairing from a replacement engine (Ref. 72-21-01) if necessary.

(1) Ensure that the safety precautions taken during removal have not been cancelled (Ref. Fig. 420).

(2) Lubricate the restraint spigot bearing assembly when supplied with a steel housing.

(a) Remove the bush from the bearing, and remove the bearing from the bearing housing.

B B B B (b) Cover the spherical face of the bearing housing with a thin film of 'Never Seez' NS-16A Aerosol Spray BA code NFLA 6170 lubricating compound. Do not lubricate ferrobestos housings.

B B (c) Assemble the bearing to the housing and wipe off any excess lubricating compound.

(d) Assemble the bush to the bearing, ensuring that the bore of the bush remains free of the lubricating compound.

RB RB RB (3) If a replacement engine is to be installed ensure that the engine is dressed for the particular engine bay into which it is to be installed. If the engine is not dressed correctly, dress the engine to the correct configuration (Ref. Power Plant Build-up Manual).

(4) Make available intercommunication between the engine hoist operator and the controller.

B (5) Position the engine stand beneath the appropriate engine bay.

(6) Fit the engine guides (Ref. para. 2.B.).

(7) Secure hoist cables to the respective engine lifting brackets (Ref. para. 2.D.).

B B B B (8) With no load on the hoist cables check the load cell readings are zero on the pendant digital display. Adjust to zero on the forward and aft potentiometers at the base of the trolley electric box.

(9) Ensure that the hoisting cable fairleads are located in the inner face of the wing bottom skin.

(10) Take up the slack in the cables until both digital displays read 100%. Equal cable tensions can be obtained by adjusting the forward leg up or down as required:

CAUTION: AS A SAFEGUARD AGAINST ELECTRONIC FAULT, CHECK TENSION IN EACH CABLE PHYSICALLY.

(11) Remove the engine exhaust cover.

(12) Ensure the engine mounting bolts to be used are new or workshop approved. Check part numbers with the IPC.

B. Install Engine

CAUTION: DURING ENGINE LIFT, HOISTING CABLES MUST BE WITHIN 5 DEGREES OF VERTICAL WITH THE ENGINE HORIZONTAL.

NOTE: The engine mounts and fittings are to be dual inspected for correct installation, applied torque loads and correct safety locking.

(1) Remove the engine from the stand.

(a) Operate the hoist pendant 'UP' until a display shows 100%. Use hoist forward leg adjustment to equalise loads in both cables to show 100% on pendant digital display.

CAUTION: 1. PHYSICALLY CHECK CABLE TENSIONS.

2. EQUAL CABLE LOADING MUST BE OBTAINED OTHERWISE DIFFICULTY MAY BE EXPERIENCED LIFTING ENGINE OUT OF ENGINE STAND.

(b) Remove the hand nuts securing the engine trunnions to the engine stand mountings and remove the mounting caps.

(c) Remove the Pip pins securing the forward mountings to the stand, lift the engine slightly to clear the stand and disengage the links from the engine brackets.

(d) Operate the hoist to raise the engine clear of the stand. Move the stand rearwards from beneath the engine. Lift the engine in a slight nose down position.

(e) Withdraw the bushes from the engine trunnions, and refit them to the stand.

(2) Fit the main mounts to the engine trunnions (Ref. Fig. 421):

NOTE: Fitting of trolley and roller assemblies to mounts depends on position of engine in nacelle i.e. 1 and 3 or 2 and 4.

(a) Bearing Assembly (EN.5958).

(i) Inspect the locking pins (P/No.E51129310000) for damage, burrs or localised swelling due to hammering on the end. High spots and burrs should be stoned down.

Inspect the extraction threads of the pin to ensure there are no broken off extractor bolts and the extractor threads must be in good condition with no signs of damage or stripping.

(ii) Try the pin for fit separately into each individual part of the trunnion assembly and then through the whole assembly. If it is a tight fit a 5/8" dia reamer can be run through the assembly.

(iii) Lubricate the mating faces of the pin, bearing, bearing housing, roller and trolley spigots with "Never-Seez" lubricating compound (Ref. 20-30-00, No.62).

(iv) Assemble the bearing, bearing housing and the roller or engine stand assembly to the engine trunnion and align the locking pin holes. Secure the assembly to the trunnion with the locking pin. If it is necessary to lightly tap the pin home, this must be done by striking on a bolt screwed into the extraction hole of the pin.

CAUTION: THE END OF THE PIN MUST NOT BE HAMMERED.

(b) Fit the guide bullets:

(i) Screw a guide bullet into the top of each forward mount (Ref. Fig. 420).

(ii) Engage the guide bullet with the restraint spigot, ensure that the restraint spigot flange and the shoulder of the guide bullet abut (Ref. Fig. 420).

(3) Fit the roll adjuster to the underside of the engine (Ref. Fig. 409).

NOTE: On No. 2 and 4 engines, shorten the length of the engine guide support strut by turning the adjuster nut four turns in the appropriate direction.

B (4) Operate the hoist to lift the engine slowly,
B monitoring cable tensions on pendant digital display
B at approx. 100% and manoeuvre the main mounts (roller and trolley) so that they engage the respective guides, continue lifting the engine until the centre wall trolley passes into the fixed section of the guide; lock the lower guide to the intermediate section of the guide with a Pip pin.

(5) Lift the engine until the roll adjuster trolley enters the centre wall guide.

NOTE: During installation, manually restrain the fuel recirculation pipe to ensure adequate clearance between the recirculation pipe and the engine oil scavenge pipe.

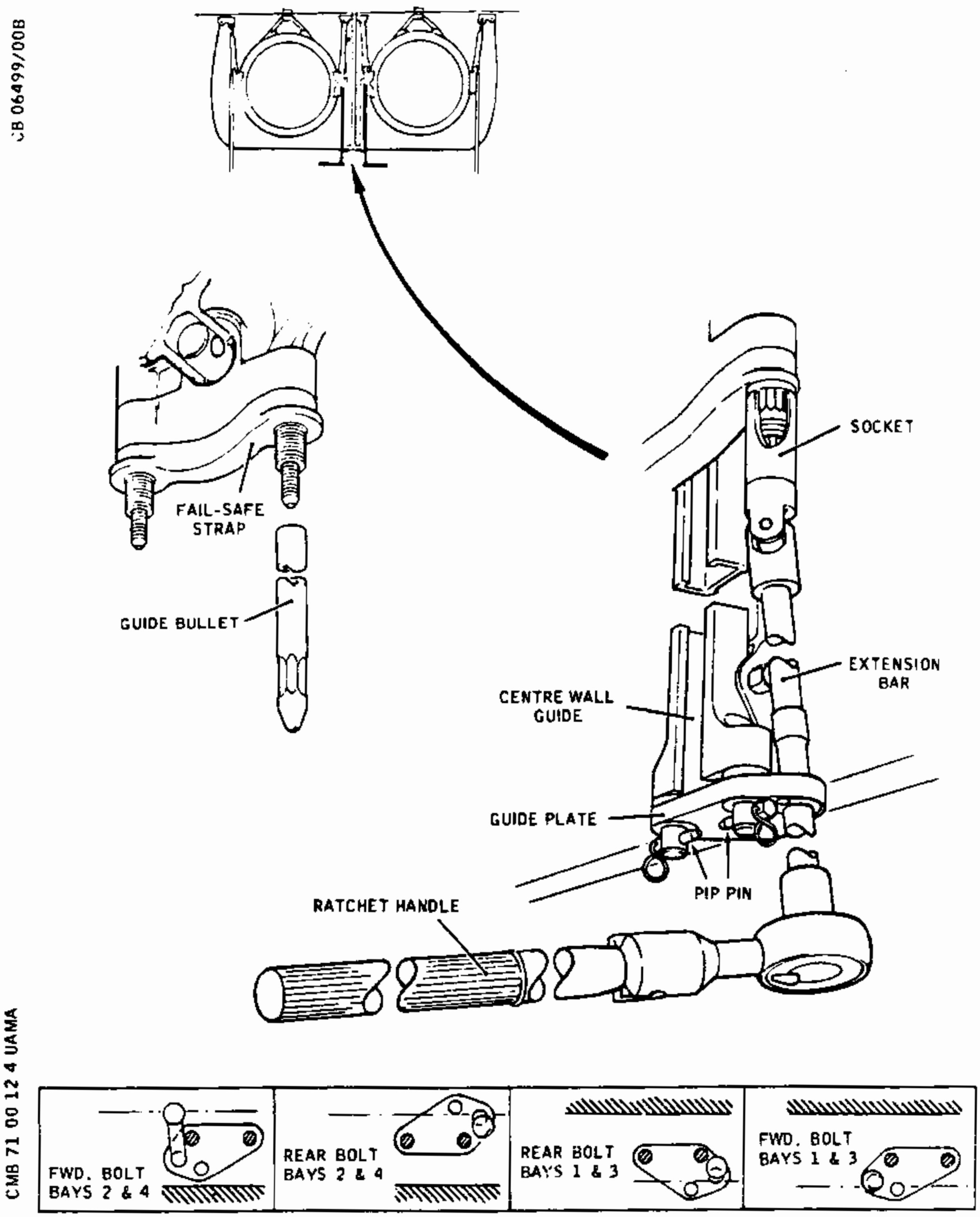
(6) Check the roll and pitch angles of the engine:

CAUTION: WHEN LIFTING NO. 2 AND 4 ENGINES, OPERATE THE ROLL ADJUSTER TO MOVE THE TOP OF THE ENGINE OUTBOARD SO THAT THE ENGINE OIL TANK REMAINS CLEAR OF THE HYDRAULIC PIPE ASSEMBLY LINK. WHEN THE ENGINE HAS BEEN RAISED SUFFICIENTLY, ADJUST THE ANGLE OF THE ENGINE CENTRE LINE SO THAT IT IS PARALLEL WITH THE CENTRE WALL GUIDE.

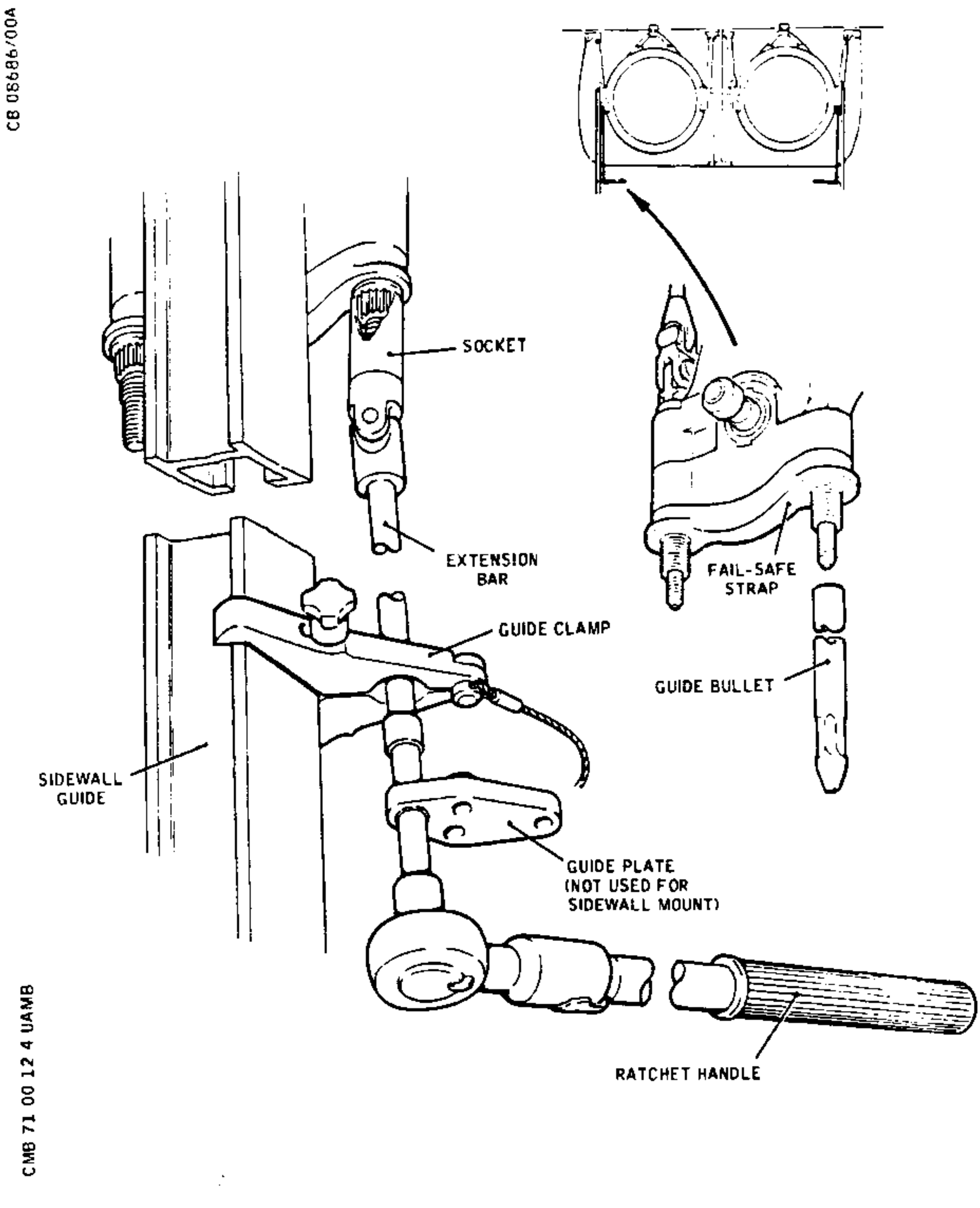
(a) Adjust the hoist forward chassis screwjack so that the engine is tilted 1 deg 35 min nose down, relative to the aircraft longitudinal datum, measure this angle with a clinometer placed on the forward face of the rear transition ring.

(b) Turn the handle of the roll adjuster jack so that the engine vertical centre line is parallel to the centre wall guide; measure the angle with a clinometer placed on the roll adjuster frame.

(7) Fit guide bullets to the main and fail-safe bolts of each main mount (Ref. Fig. 426).



Engine Mounts - Tools (Sheet 1 of 2)
Figure 426



Engine Mounts - Tools (Sheet 2 of 2)
Figure 426

(8) Continue lifting the engine until the trolley assembly of the main mount moves into the fixed section of the centre wall guide.

B (9) Adjust the forward leg support so that the engine is
B tilted 1 deg 40 min nose down relative to the aircraft
B longitudinal datum.

B (10) Continue lifting until engine is approx. 18 in
B (457.2 mm) from the installed position. Withdraw the
B fairleads from the wing bottom skin and suspend them
B from the hooks on the hoist chassis by the retaining
B cables.

B <u>CAUTION:</u> FAILURE TO REMOVE THE FAIRLEADS WILL RESULT
B IN DAMAGE TO THE AIRCRAFT.

B (11) Continue lifting the engine and watching digital
B display readout to prevent snagging.

(12) Ensure that the guide bullets on each forward mount and the restraint spigot are engaged with the associated fittings.

(13) Ensure that fail-safe bolt guide bullets enter the bearing housing holes of each main mount.

(14) Guide the flexible hydraulic hoses on the centre wall side of the engine into their respective connections and hand tighten the self-sealing couplings until locking occurs.

B (15) Continue lifting the engine until the main mount
B bearing housings abut the thrust strut lower fittings.
B To make sure the engine is tight in the main mount
B bearing housings, increase cable tension to 115% on
B digital display.

B (16) Secure the sidewall main mount (Ref. Fig. 420
B and 426):

R (a) Remove the guide bullets from the main and
R fail-safe bolts. Make sure that the fail-safe
R bolts are correctly seated in their respective
R main engine mounting bolts, and that the heads of
R the main engine bolts are correctly seated in the
R anti-rotation fixtures (Ref. Fig. 420, Detail D).
R Engage the fail-safe strap on the main bolts.
R Fit a special nut on each main bolt and
R hand-tighten the special nut.

B NOTE: When assembling the fail-safe strap and special washers, ensure that orientation is as shown in Fig. 420, the strap should be flush with the adjacent assembly.

(b) Fit the 3/4 in drive socket and universal joint to the torque equipment bar.

(c) Fit the extension bar to the sidewall guide positioning the hinged guide clamp to suit.

B (d) Torque load each nut to between 1900 and 1950 lbf in (21.28 and 21.84 mdaN).

R CAUTION: MAKE SURE THAT THE HEAD OF THE MAIN ENGINE MOUNTING BOLT IS CORRECTLY ENGAGED WITH THE FACE OF THE ANTI-ROTATION FITTING. MAKE SURE THAT IT DOES NOT MOVE FROM THIS POSITION DURING INSTALLATION AND WHEN TORQUE LOADING THE SPECIAL NUT.

(e) Remove the torque loading equipment from the guide.

(f) Fit a special washer and nut to each fail-safe bolt and with the appropriate socket and 1/2 in drive extension tool, torque load each nut to
B 475 ± 5 lbf in (5.367 ± 0.0565 mdaN).

(17) Remove the lower and the intermediate centre wall guides (Ref. Fig. 408).

B WARNING: THESE ARE HEAVY DON'T DROP THEM ON YOUR FEET.

INTENTIONALLY LEFT BLANK

(18) Secure the centre wall main mount (Ref. Fig. 420 and 426):

R (a) Remove the guide bullets from the main and fail-safe bolts. Make sure that the main and fail-safe bolts are correctly seated in their respective main engine bolts, and that the heads of the main engine bolts are correctly seated in the anti-rotation fixtures (Ref. Fig. 420, Detail D).
Engage the fail-safe strap on the main bolts. Fit a special nut on each main bolt and hand-tighten the special nut.

(b) Fit the 3/4 in drive socket and universal joint to the torque equipment extension bar.

(c) Fit the extension bar and guide plate assembly to the upper section of the centre wall guide locating it in the appropriate position indicated on Fig. 418 and retain it with Pip pin(s).

(d) Torque load each nut to between 1900 and 1950 lbf in (21.28 and 21.84 mdaN).

R CAUTION: MAKE SURE THAT THE HEAD OF THE MAIN ENGINE MOUNTING BOLT IS CORRECTLY ENGAGED WITH THE FACE OF THE ANTI-ROTATION FITTING. MAKE SURE THAT IT DOES NOT MOVE FROM THIS POSITION DURING INSTALLATION AND WHEN TORQUE LOADING THE SPECIAL NUT.

(e) Remove the torque loading equipment from the guide.

(f) Fit a special washer and nut to each fail-safe bolt and with the appropriate socket and 1/2 in drive extension tool, torque load each nut to
RB 475 ± 5 lbf in (5.367 ± 0.0565 mdaN).

(19) Secure the engine forward mounts (Ref. Fig. 420):

NOTE: Smear the coned surfaces of the bracket and the retainer with 'Never-Seez' lubricating compound (Ref. 20-30-00, product No.62).

(a) Remove the guide bullets from each forward mount.

(b) Secure each mount to a bottom wing bracket by locating the cone on the mount and aligning the flanges with the recess in the bracket, fit a special washer and a nut; torque load the nut to 475 ± 5 lbf in (5.262 and 5.375 mdaN).

(c) Position the lock washer on the splines of the mount so that the lugs on the washer will be positioned between those of the nut. Using the assembly tool, force the lock nut down the splines of the mount until it abuts the nut. Fit the spring clip for the mount.

(20) Secure the restraint spigot (Ref. Fig. 420):

(a) Remove the guide bullet from the spigot.

(b) Install the bearing assembly on the spigot with the bearing entry slots running fore and aft.

(c) Secure the spigot to the wing bracket with a nut. Torque load the nut to between 980 and 1020 lbf in (11.0 and 11.45 mdaN) and lock the nut to the bracket in two places with wire.

(21) Operate the hoist control pendant slow "DOWN" until the cables are slack.

(22) Remove the pins securing the front and rear cables to the respective engine lifting brackets.

(23) Fit a cover and cup heat shield to the bottom of the equipment bay above each engine lifting bracket and secure each heat shield with washers and screws; torque load each screw to between 5 and 10 lbf in (0.055 and 0.11 mdaN).

<u>CAUTION</u>: IT IS ESSENTIAL THAT A CUP HEAT SHIELD IS FITTED ABOVE EACH ENGINE LIFTING BRACKET

(24) Check the fire extinguisher bottle in the equipment bay (Ref. 26-21-11) to ensure that the bottle has not been disturbed.

(25) Using suitable lifting equipment remove the hoist from the wing.

(a) Disconnect the GPU electrical supply from the trolley.

(b) Disconnect and stow electrical lead between load cells and electrical box.

(c) Disconnect electrical lead between pendant and electrical box.

(d) Remove dipstick from hydraulic reservoir, wipe and stow. Fit blanking plug to dipstick boss.

(e) Disconnect the hydraulic motor, blank all pipes.

(f) Remove forward cable from pulley Vee and rotate forward beam rearwards onto top of aft beam.

(g) Assemble sling and using crank lift hoist assembly from wing and stow in dry clean area.

(26) If lifting equipment is not available, disassemble the engine hoist and manhandle the components to the ground (Ref. para 2. B.).

(27) Remove the engine hoist locating bushes from the wing:

(a) Depress each bush, turn it 90 deg anti-clockwise and release the pressure.

(b) Remove the bush and ensure that the spring loaded disc is flush with the wing top surface.

(28) Ensure that the area is clear of equipment and tools and fit the access panels located in the wing top surface.

(29) Remove the protective mats from the wing top surface.

(30) Remove the roll adjuster from the engine underside (Ref. Fig. 409).

(31) Remove the centre wall and side wall guides, support strut and brackets (Ref. Fig. 408).

<u>WARNING</u>: THE GUIDE RAILS ARE VERY HEAVY. ONCE THE PIN IS OUT, THE BALL SOCKET AT TOP END WILL NOT HOLD THE GUIDE RAIL. TAKE EXTRA CARE TO AVOID INJURY.

(32) Fit the seal plate and seal bracket to the base of the centre wall vertical joint with bolts and nuts. Torque load each nut to between 35 and 40 lbf in (0.39 and 0.45 mdaN).

C. Connect Services

NOTE: Before proceeding with the following operations ensure that:

(a) The hoists, roll adjuster, centre and sidewall guides are disconnected from the engine.

(b) The engine front face is in alignment with the air intake diffuser ring.

(1) Install intake joint ring (Ref. 71-21-11, Removal/Installation).

(2) Connect the hydraulic couplings (Ref. Fig. 410):

CAUTION: IF A FLEXIBLE HYDRAULIC HOSE HAS BEEN REMOVED FROM A PREVIOUSLY INSTALLED ENGINE, DO NOT STRAIGHTEN THE HOSE FROM ITS ACQUIRED SHAPE; WHEN INSTALLING A HOSE MAINTAIN ANY PRE-FORMED RADIUS.

AFTER INSTALLATION ENSURE THAT FLEXIBLE HOSES DO NOT CONTACT THE SIDE PANEL OF THE ENGINE BAY FORWARD DOOR.

B (a) Connect the self sealing couplings by screwing
B locking sleeve of the socket on the fixed nipple
B until the 'safe-lock' ring of the nipple is seen
B to move automatically into engagement with the
B locking sleeve. Check that correct locking of
B the nipple has been achieved by attempting to
B unscrew the locking sleeve. This must be
B impossible.

(b) On No.1 and 3 engines, check that the flexible delivery hose is set against the PTFE faced rubbing bracket on the engine flange. If adjustment is required, proceed as follows:

(i) Slacken the elbow to coupling gland nut.

(ii) Set the hose against the PTFE faced bracket and re-tighten the nut. Torque load to between 500 and 825 lbf in (5.60 and 9.24 mdaN).

(c) On No.2 and 4 engines secure the self-sealing couplings to the centre wall brackets with bolts, washers and nuts. Torque load each nut to between 25 and 30 lbf in (0.28 and 0.34 mdaN), and lock it with a split pin.

(3) Connect the hydraulic tank pressurization flexible hose to its associated fitting (Ref. Fig. 411). Torque load the hose union nut to between 200 and 220 lbf in (2.24 and 2.46 mdaN). Lock the nut to the fitting with wire.

(4) Connect the fuel services (Ref. Fig. 416):

<u>NOTE</u>: Lubricate new O-ring seals with petroleum jelly DEF. 2333 before fitting.

(a) Secure the main fuel feed pipe:

(a1) Remove the cover from the engine inlet connection.

(a2) Fit new O-ring seals to the pipe.

(a3) Secure the pipe to the engine inlet connection with the clamp. Torque load the clamp bolt to between 100 and 110 lbf in (1.12 and 1.23 mdaN).

(b) Connect the drain pipes at the banjo connection adjoining the feed pipe engine connector. Torque load each nut to between 85 and 95 lbf in (0.95 and 1.05 mdaN), and lock it with wire.

(c) Secure the recirculation pipe (No. 1 and 3) engines):

(c1) Fit a new O-ring seal to the pipe.

(c2) Connect the flexible hose to the upper end of the engine mounted pipe.

(c3) Torque load the union nut to between 75 and 125 lbf in (0.84 and 1.40 mdaN) and lock it with wire.

(d) Secure the recirculation pipe (No. 2 and 4 engines).

(d1) Fit a new O-ring seal to the flexible pipe, and connect the pipe to the fitting. Torque load the union nut to between 75 and 124 lbf in (0.84 and 1.40 mdaN) and lock it with wire.

(5) Connect the fire extinguisher flexible hose to the pipe mounted on the underside of the rear transition ring adjoining the nacelle centre wall (Ref.Fig.417). Torque load the union nut to between 300 and 330 lbf in (3.36 and 3.70 mdaN) and lock it with wire.

Connect the air conditioning ducting (Ref. Fig.415):

(a) Fit a new seal to the pipe connecting the air conditioning reducing and shut-off valve to the engine non-return valve, and secure the pipe to the non-return valve with a clamp; torque load the clamp nut to between 137 and 147 lbf in (1.53 and 1.65 mdaN). Leak check in accordance with Ref. 21-00-00.

(b) Unbolt the appropriate fail safe strut and refit the ultra violet detector. Torque load to between 25 and 30 lbf/in (0.28 and 0.34 mdaN). Refit the fail safe strut and torque load the link bolt to between 45 and 51 lbf/in (0.51 and 0.576 mdaN).

(c) Fit a new seal and connect the starter ducting to the intercommunication valve, and secure it with a clamp; torque load the clamp nut to between 101 and 111 lbf in (1.13 and 1.24 mdaN).

(d) Fit a new seal to the centre wall coupling (No. 2 and 4 engines only), secure the duct with a clamp; torque load the clamp nut to between 101 and 111 lbf in (1.13 and 1.24 mdaN).

NOTE: Remove and discard supplied spacers from the duct support struts.

(e) Fit the duct support struts to the engine mounted stator pins, with special washer and nut; torque load each nut to between 135 and 145 lbf in (1.51 and 1.63 mdaN).

(f) Check that the clearances between the duct and the engine, and the duct and the engine bay door are within the limits issued by the Design Office.

(g) If the clearances are incorrect, alter the length of each support strut as necessary:

NOTE: Ensure that each gimbal is in direct alignment with its associated duct.

(g1) Remove the strut from the engine mounted stator pins and from the duct.

(g2) Remove the end cap from the strut and fit spacers to achieve a nominal length between centres of 6.70 in (17.02 cm) on the upper strut, and 8.70 in (22.10 cm)

on the lower strut.

(g3) Fit the end cap to the strut and hand tighten it. Lock the end cap to the strut with wire.

(g4) Secure the strut to the duct with a bolt, washer and nut; torque load the nut to between 25 and 30 lbf in (0.28 and 0.34 mdaN) and lock it with a split pin.

(g5) Secure the strut to the engine mounted stator pin with a washer and nut; torque load the nut to between 135 and 145 lbf in (1.51 and 1.63 mdaN).

(h) Fit the four way duct (No.1 and 3 engines) (Ref. Fig. 415):

NOTE: If replacement parts are fitted, adjust the length of the tie rods as necessary to align the ducts.

(h1) Check that the non-return valve flap in the four way duct returns to its seating when manually operated.

(h2) Support the duct in position and secure the tie rods to the centre wall brackets with two quick release pins.

(h3) Fit a new seal to the centre wall coupling and secure the duct with a clamp; torque load the clamp nut to between 101 and 111 lbf in (1.13 and 1.24 mdaN).

(h4) Fit new seals to the starter duct and secure it to the four way duct with a keep ring and clip. Torque load the clip nut to between 5 and 10 lbf in (0.06 and 0.11 mdaN) and lock it with a split pin.

(h5) Fit a new seal to the cross-bleed duct and secure it to the four-way duct at the slider housing with a keep plate, washers and bolts. Torque load each bolt to between 25 and 30 lbf in (0.28 and 0.34 mdaN) and lock it with wire.

(j) Adjust the four-way duct:

(i) Secure the four-way duct to the centre wall coupling.

(ii) Attach the tie-rods and adjust each to obtain a free fit of the tie-rod pins to the mounting brackets; ensure that there is an equal amount of thread engaged at each end of the tie-rod.

(iii) Secure the starter and cross bleed duct attachment.

(iv) Torque tighten the tie-rod locknuts:

Tie rod, aft upper (nominal length 7.3 in (178.5 mm)) torque loading 50-60 lbf in (0.56 - 0.67 mdaN).
Tie rod, aft lower (nominal length 5.0 in (127 mm)) torque loading 50-60 lbf in (0.56 - 0.67 mdaN).
Tie rod, forward (nominal length 6.75 in (171.4 mm)) torque loading 80-90 lbf in (0.90 - 1.02 mdaN).

and lock each one between the centre of the tie rod and the end fitting.

(7) Engage the jet pipe with the engine exhaust diffuser (Ref. Fig. 419):

(a) Check the security of the cradle to the jet pipe, and the support frame to the structure and cradle.

(b) Ensure that each ball roller is in firm contact with the support frame.

(c) Slide the jet pipe forward, adjusting the cradle screw ball assemblies, as necessary, until the jet pipe and engine exhaust diffuser are in alignment; engage the jet pipe with the exhaust diffuser.

(d) Ensure that the link is engaged with the jet pipe fitting, pivot the link forward and engage the spherical joint with the exhaust diffuser
RB fitting. Secure with new bolts and washers
RB (apply lubricant 'S'). Torque to 88.5 - 96.35 lbf in (1.0 - 1.1 mdaN).

NOTE: Confirm that the rear end of the connecting link is secured in its spherical joint on the reheat pipe.

(e) Remove the support frame from the pivot and pad; remove the pivot and pad from the nacelle structure.

(f) Remove the ball rollers from the cradle and stow them on the support frame.

(g) Remove the cradle from the jet pipe:

(8) Connect the jet pipe drains flexible hose to the rigid pipe located on the underside of the jet pipe (Ref. Fig. 419). Torque load the union nut to between 160 and 180 lbf in (1.78 and 2.02 mdaN) and lock it with wire.

(9) Connect the pneumatic system pipes to the engine bay centre wall and to the engine (Ref. Fig. 418):

(a) Fit new seals to the ground running valve and secure it to the centre wall mounting plate with washers and nuts. Torque load each nut to between 50 and 60 lbf in (0.56 and 0.67 mdaN) and lock it with a split pin.

(b) Connect the ground running valve to the P3 supply pipe with a clamp. Torque load the clamp nut to 53 lbf in (0.6 mdaN).

(c) Secure the clamp half mounting assembly to the centre wall brackets using a washer and a bolt at each end. Torque load the bolts to between 90 and 100 lbf in (1.01 and 1.12 mdaN) and lock the bolts with wire to the clamp half.

(d) Fit seals in the pipe elbows and secure them with a half clamp and three bolts to the clamp half mounting. Align the pipe elbows and torque load the clamp bolts to between 50 and 60 lbf in (0.56 and 0.67 mdaN) and lock with wire.

(e) Connect the pipe elbows to the PNC valve supply pipe and the ground running valve with clamps. Torque load each clamp nut to 53 lbf in (0.6 mdaN).

(f) Connect the primary and secondary nozzle supply pipes to the pipe elbows. Torque load each pipe

securing nut to between 600 and 660 lbf in (6.72 and 7.39 mdaN).

RB NOTE: Use tool PM82451. Refer to torque
RB tightening techniques (Ref. 70-00-04
RB P.Block 200)

(g) Connect the flexible reheat igniter P3 pipe to the elbow adapter, torque load the union nut to between, large end 160 and 180 lbf in (1.79 and 2.01 mdaN), small end 140 and 160 lbf in (1.57 and 1.79 mdaN) and lock with wire.

(h) Connect the PNC and PJ flexible hoses to the associated adapters on the engine bay centre wall. Torque load each union:

PNC hose to between 200 and 220 lbf in (2.24 and 2.46 mdaN)
PJ hose to between 105 and 115 lbf in (1.17 and 1.27 mdaN)

Lock each nut to the associated adapter with wire.

(10) Connect the power indicator pipe to the jet pipe (Ref. Fig. 419):

(a) Connect the elbow on the end of the power indication flexible pipe to the jet pipe adapter.

(b) Torque load the union nuts to between 140 and 160 lbf in (1.57 and 1.79 mdaN) and lock with wire.

(11) Connect the reheat detection flexible pipe to the engine adapter (Ref. Fig. 419); torque load the union nut to between 140 and 160 lbf in (1.57 and 1.79 mdaN) and lock with wire.

(12) Connect the electrical services No.1 and 3 engines.

NOTE: Electrical connections are to be made in accordance with the cable identification and the applicable wiring diagram.

(a) Connect the bonding lead to the bracket at the engine delivery casing with a bolt and nut, (Ref. 20-27-12). Torque load the nut to between 60 and 70 lbf in (0.67 and 0.78 mdaN) (Ref. Fig. 414).

(b) Attach the reheat igniter box to the centre wall and connect the electrical cables

(Ref. Fig. 414).

(b1) Secure the two bottom reheat igniter box attachments with washers and nuts. Torque load each nut to between 25 and 30 lbf in (0.29 and 0.34 mdaN); lock each nut with a split pin. Secure the igniter at the top with a nut; torque load to between 50 and 60 lbf in (0.56 and 0.67 mdaN).

(b2) Connect the electrical cable socket to the receptacle on the forward face of the igniter box; wire-lock the connection.

(b3) Connect the igniter plug cable to the receptacle on the underside of the igniter box.

(b4) Connect the earth lead to the connection on the underside of the igniter box.

(c) Connect the flame detection head and radiation shield (Ref. Fig. 414):

(c1) Secure the flame detection head assembly to the centre wall brackets with nuts. Torque load each nut to between 50 and 60 lbf in (0.56 and 0.67 mdaN).

(c2) Secure the electrical cable to the detection head; wire-lock the connection.

(d) Connect the generator (Ref. Fig. 414):

(d1) Remove the cover.

(d2) Fit the spade connectors marked C, B, A and N to the associated terminals. Torque load each terminal nut to 200 lbf in (2.24 mdaN). Refit the cover.

(d3) Connect the electrical plug to the receptacle on the generator marked CON; wire-lock the connection.

(e) Connect the two electrical plugs to the HP fuel shut-off valve ensuring that the mating surfaces are clean and undamaged; wire-lock the connectors. Secure the electrical cable to the support rail with clips, washers and screws then

lock each screw with wire (Ref. Fig. 412).

(f) Assemble the electrical harness support trays to the engine brackets (Ref. Fig. 412):

NOTE: If replacement items are installed, adjust the length of the tie rod as required.

(f1) Ensure that the lining of each support tray and cover is free from wear and/or damage.

(f2) Loosely attach the trays to the upper and lower brackets with bolts, washers and nuts.

(f3) Assemble the tie rod to the centre bracket with a bolt washer and nut.

(f4) Torque load each nut to between 12 and 15 lbf in (0.13 and 0.17 mdaN) and lock it with a split pin.

(g) Support the electrical cables so that they lay correctly in the support trays, retain the cables with clamp blocks, bolts washers and nuts.

(h) Ensure that the cables are not kinked or twisted and that there is no excess cable, between the connectors at the disconnect box and the top of the trays, that could cause the cables to bulge towards the nacelle door and promote chafing. Torque load the nuts securing the clamp blocks to between 60 and 70 lbf in (0.67 and 0.78 mdaN).

(j) Connect the electrical plugs to the forward disconnect box (Ref. Fig. 412):

NOTE: Each receptacle ident. number is prefixed by the appropriate engine position number, e.g. 2U 4008.

(j1) Connect the electrical plugs B,C,D,E,F,G and H to the associated receptacles U.4001, U4002,U4003,U4004,U4005,U4006 and U4007 in the forward disconnect box, ensuring that their mating surfaces are clean and undamaged. Wirelock the plugs.

(j2) Install the front and rear covers to the forward disconnect box with washers and bolts; torque load each bolt to between 60 and 70 lbf in (0.67 and 0.78 mdaN).

(k) Secure the HP valve cable to the support tray with P-clips, washers and screws (Ref. Fig. 412).

(l) Assemble the covers to the support trays with spring loaded studs.

(m) Connect the thermocouple (Ref. Fig. 414):

B (m1) Inspect aircraft wiring terminal tags for satisfactory condition.

B (m2) Secure the aircraft mounted terminals to engine mounted hot and cold vent and EGT thermocouple pillars with two half nuts; torque tighten to 15 lbf - in. (0.16 mdaN) maximum.
(EN 6062)

B Special Tools

B	TOOLS	STORES CODE
B	3/16" x 7/32" AF - thin set spanner	HXWS 0502
B	1/4" x 9/32" AF - thin set spanner	HXWS 0507
B	7/32" AF - thin walled socket - l/4 drive	HZAS 3976
B	0-45 lbf-in-torque screwdriver	HMVW 1125

B CAUTION : DO NOT OVERTORQUE THE HALF-NUTS. PILLARS (ALUMEL/CHROMEL) CAN BE DAMAGED AND/OR COMPLETELY SHEARED AT NEXT DISASSEMBLY.

B (m3) Fit the cover to the junction box with nuts. Torque load each nut to between 60 and 65 lbf in (0.67 and 0.73 mdaN).

B (m4) Secure the cable and support rail to the engine with clips.

(n) Connect the jet pipe vibration transducer (Ref. Fig. 419):

(n1) Remove the access panel from the jet pipe heatshield.

(n2) Support the transducer assembly and remove the wing screws securing it to the engine stowage position; remove the transducer.

(n3) Engage the transducer and mounting flange assembly with the jet pipe, secure it with existing bolts and lock washers. Torque load each bolt to between 9 and 12 lbf in (0.1 and 0.13 mdaN).

(n4) Position the access panel on the jet pipe heat shield and secure it with a bolt, washer and nut.

(n5) Secure the electrical cable to the jet pipe shroud using the existing clip, bolt and nut. Torque load the bolt to to between 60 and 65 lbf in (0.67 and 0.73 mdaN).

(13) Connect the electrical services No.2 and 4 engines:

NOTE: Electrical connections are to be made in accordance with the cable identification and the applicable wiring diagram.

(a) Connect the bonding lead to the bracket at the engine delivery casing with a bolt and nut (Ref.20-27-12). Torque load the nut to between 60 and 70 lbf in (0.67 and 0.78 mdaN) (Ref. Fig. 414).

(b) Attach the reheat igniter box to the centre wall and connect the electrical cables (Ref. Fig. 414):

(b1) Secure the two bottom reheat igniter box attachments with washers and nuts. Torque load each nut to between 25 and 30 lbf in (0.29 and 0.34 mdaN) lock each nut with a split pin. Secure the igniter at the top with a nut; torque load the nut to between 50 and 60 lbf in (0.56 and 0.67 mdaN).

(b2) Connect the electrical cable socket to the receptacle on the forward face of the igniter box; wire-lock the connector.

(b3) Connect the igniter cable to the receptacle on the underside of the igniter box.

(b4) Connect the earth lead to the connection on the underside of the igniter box. Torque load the nut to between 66.5 and 84.0 lbf in (0.75 and 0.95 mdaN).

(c) Connect the flame detection head (Ref. Fig. 414):

(c1) Secure the flame detection head assembly to the centre wall brackets with nuts. Torque load each nut to between 50 and 60 lbf in (0.56 and 0.67 mdaN).

(c2) Secure the electrical cable to the detection head; wire-lock the connector.

(d) Connect the generator (Ref. Fig. 414):

(d1) Remove the cover.

(d2) Fit the spade connectors marked C, B, A and N to the associated terminals. Torque load each terminal nut to 200 lbf in (2.26 mdaN). Refit the cover.

(d3) Connect the electrical plug to the receptacle on the generator marked CON; wire-lock the connector.

(e) Connect the two electrical plugs to the receptacles on the HP fuel shut-off valve; wire-lock the connector (Ref. Fig. 412).

(f) Assemble the electrical harness support trays to the engine brackets (Ref. Fig. 413):

<u>NOTE</u>: If replacement items are installed, adjust the length of the tie rods as required.

(f1) Ensure that the lining of each support tray and cover is free from wear and/ or damage. Loosely attach the trays

to the upper and lower brackets with bolts, washers and nuts.

Assemble the tie rod to the centre bracket with a bolt, washer and nut. Torque load each nut to between 12 and 15 lbf in (0.13 and 0.17 mdaN) and lock it with a split pin.

(f2) Remove the loosely assembled nut and washers from the air starter duct support bracket bolt, connect the tie rod to the bolt, and secure with washers and a nut. Torque load the nut to between 10 and 15 lbf in (0.11 and 0.16 mdaN) and lock it with a split pin.

(f3) Secure the upper support tray to the thrust strut bracket with a bolt, washer and nut. Torque load the nut to between 12 and 15 lbf in (0.13 and 0.17 mdaN) and lock it with a split pin.

(g) Position the electrical cables in the trays:

(g1) Support the electrical cables so that they lie correctly in the trays; retain the cables with clamp blocks, bolts, washers and nuts.

(g2) Ensure that the cables are not kinked or twisted. Torque load the nuts securing the clamp blocks to between 60 and 70 lbf in (0.67 and 0.78 mdaN).

(h) Connect the electrical plug to the forward disconnect box:

NOTE: Each receptacle ident. number is prefixed by the appropriate engine position number e.g. 2U 4008.

(h1) Connect the electrical plugs B, C, D, E, F, G and H to the associated receptacles U4001, U4002, U4002, U4004, U4005, U4006 and U4007 in the forward disconnect box, ensuring that their mating surfaces are clean and undamaged. Wirelock the plugs.

(h2) Install the front and rear covers to

the forward disconnect box with washers and bolts; torque load each bolt to between 60 and 70 lbf in (0.67 and 0.78 mdaN).

(j) Secure the generator control cable to the support tray with P-clips, washers and screws.

(k) Assemble the covers to the support trays with spring loaded studs.

(m) Connect the thermocouple (Ref. Fig. 414):

(m1) Inspect aircraft wiring terminal tags for satisfactory condition.

(m2) Secure the aircraft mounted terminals to the engine mounted hot and cold vent and EGT thermocouple pillars with two half nuts; torque tighten to 15 lbf - in. (0.16 mdaN) maximum

Special Tools

TOOL	STORES CODE
3/16" x 7/32" AF - thin set spanner	HXWS 0502
1/4" x 9/32" AF - thin set spanner	HXWS 0507
7/32" AF - thin walled socket - 1/4 drive	HZAS 3976
0-45 lbf-in-torque screwdriver	HMVW 1125

CAUTION : DO NOT OVERTORQUE THE HALF-NUTS. PILLARS (ALUMEL/CHROMEL) CAN BE DAMAGED AND/OR COMPLETELY SHEARED AT NEXT DISASSEMBLY.

(m3) Fit the cover to the junction box with nuts, torque load each nut to between 60 and 65 lbf in (0.67 and 0.73 mdaN).

(m4) Secure the cable and support rail to the engine with clips.

(n) Connect the jet pipe vibration transducer (Ref. Fig. 419):

(n1) Remove the access panel from the jet pipe heatshield.

(n2) Support the transducer assembly and remove the wing screws securing it to the engine stowage position, remove the transducer.

(n3) Engage the transducer and mounting flange assembly with the jet pipe, secure it with existing bolts and lock washers. Torque load each bolt to between 9 and 12 lbf in (0.1 and 0.13 mdaN).

(n4) Engage the access panel with the jet pipe heatshield and secure it with a bolt, washer and nut.

(n5) Secure the electrical cable to the jet pipe shroud using the existing clip, bolt and nut. Torque load the nut to between 60 and 65 lbf in (0.67 and 0.73 mdaN).

(o) Connect the instrumentation plugs to the receptacles at the front of the engine.

(14) Remove the safety clips and set the circuit breakers.

(15) Connect the intercommunication set to the aircraft interphone system jack on the underside of the engine air intake.

(16) Bleed and pressure test the fuel main feed connection. (Ref.28-21-00):

(a) Make available ground power (Ref.24-41-00).

(b) On the fuel management panel, lift the guard and operate the switch engraved LP VALVE to "OPEN"; release the guard.

(c) Check that the adjacent magnetic indicator shows 'in-line' (vertical).

(d) Operate the appropriate fuel pump switch engraved ENGINE FEED PUMPS to "ON" and inspect the main fuel feed connection for leakage of fuel.

(e) Operate the fuel pump switch to "OFF".

(17) Pressurize the yellow hydraulic system and the relevant main hydraulic system and prime and bleed the hydraulic suction pipeline in the wing in accordance with:

29-11-71 engines 1 & 2 (green system)
29-12-71 engines 3 & 4 (blue system)
29-21-71 engines 2 & 4 (yellow system)

RB (18) Check the operation of the oil tank transmitter and overfull switch in accordance with 79-10-00 page block 300.

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R (19) Remove all items of protective and maintenance equipment from the air intake (Ref. 71-00-00 Servicing).

R (20) Remove the portable staging from the work area.

R (21) Remove the warning placard from the engine starting panel.

RB (22) Final inspection

B CAUTION: ENSURE THAT THE CABLE AND MECHANISM IS NOT DISTURBED AFTER INSPECTION OF LP SHAFT SIGNAL SYSTEM, OTHERWISE SIGNIFICANT LOSS OF ENGINE POWER CAN OCCUR.

B (a) Visually check the LP shaft signal system and verify that red indicator mark of reset plunger is not visible (Ref. 76-21-00 page block 600 Para 3. E.).

B (b) Inspect engine and engine bay for leakage of fuel, oil and hydraulic fluid and for security of parts.

R (23) Close the engine bay doors and side panels (Ref. 71-00-00, Servicing).

R (24) Remove the intercommunication equipment.

R (25) Check the Modification/Service Bulletin standard of engine for embodiment of SB OL 593-72-8562.

CAUTION: IF THE SB HAS BEEN EMBODIED, ADDITIONAL ENGINE LIMITATION PLACARDS AT EACH OF THE FLIGHT CREW STATIONS AND A LABEL ON THE APPROPRIATE ENGINE OIL PRESSURE INDICATOR (REF. 11-33-00) MUST BE FITTED. WHEN AN ENGINE TO PRE SB OL 593-72-8562 STANDARD IS SUBSEQUENTLY FITTED TO THAT PARTICULAR POSITION THE LABEL ON THE APPROPRIATE OIL PRESSURE INDICATOR MUST BE REMOVED.

RB (26) Ensure both engine control amplifiers are set at
B switch position 2.

NOTE: RATING 2 operating conditions apply for engines with OL 72-8679-282 or OL 72-8706-264 or OL 72-8709-259 standard of combustion chamber installed with type PA6A16/24DC engine control amplifiers with the EGT switch set at Position 2 in both main and alternate lanes.

RATING 1 operating conditions apply for engines without OL 72-8679-282 or OL 72-8706-264 or OL 72-8709-259 standard of combustion chamber installed with type PA6A16/24DC engine control amplifiers with the EGT switch set at Position 1 (or earlier type PA6A16/24CA or CC amplifiers) in both main and alternate lanes.

If necessary, one modified engine per aircraft may be installed with an earlier type PA6A16/24CA or CC amplifier on both main and alternate lanes. If circumstances dictate, one lane of this engine may be controlled by a type PA6A16/24DC amplifier in which case the EGT switch should be set at Position 1 to avoid a change of operating condition should the type PA6A16/24DC amplifier fail while in use. This combination is also identified as RATING 1.

R (27) Check to ensure that the correct placards (Ref. 11-33-00) are installed on the aircraft and that the correct rating for each engine is displayed by the EGT indicator rating placards at the pilot's centre instrument panel (6-211).

R (28) Ground run the engine in accordance with the instructions contained in 71-00-00, Adjustment/Test.

(29) Raise a cat Q ADD to recheck the starter QAD ring torque Ref. 70-00-06 in accordance with MM 80-11-11, Starter Installation, at the next three LHR turnrounds.

(30) Raise a cat Q ADD to recheck the IDG, FCU and FSP QAD ring torques Ref. 70-00-06 in accordance with MM 24-11-11 IDG Installation, MM 73-21-01, FCU Installation and MM 73-11-01, FSP Installation respectively, at the next LHR turnround or fourth sector, whichever is sooner.

(31) Raise a cat Q ADD to carry out igniter plug penetration checks to both igniters in accordance with MM 74-21-02, Engine Igniter Plug Inspection Check, at the next return to LHR, eight sectors after installation.

(32) Change the master, Nos.2 and 3 bearing and scavenge magnetic plug assemblies. Label with aircraft registration, engine serial number and position and dispatch to EMH (Ref. 72-01-00, Servicing).

NOTE: Clearance from EHM prior to flight is not required.

(33) Take an oil sample for spectrometric analysis (Ref. 79-00-03 Inspection/Check). The sample must be taken within two hours of the engine run and prior to replenishing the oil tank. Label sample with aircraft registration, engine serial number and position.

TWIN SECONDARY NOZZLE - TROUBLE SHOOTING

1. Failure to Reach Fully Open Position

A. General

B It has been noticed that often the secondary nozzle (buckets) fails to reach the fully open position (0°) during the transonic acceleration at Mach No.1.1. At 1.2 Mach No. the air shut off valve (ASOV) closes and isolates the system.

B Rig testing conducted by Garrett Airsearch has confirmed that the failure to reach the fully open position is due to an insufficient output signal from the bucket pneumatic actuator (air motor) linear variable differential transformer (LVDT) near the 0° position. This prevents the normal action of the brake whilst the ASOV closes, leaving the buckets subject to aerodynamic forces and vibration at Mach No.1.2, however constrained by mechanical friction. A modification will be introduced which amplifies the control signal near the 0° position and thus ensures that the buckets modulate fully to 0°. It should be noted that bucket positions below 5° do not impose any performance penalties on the aircraft.

B B. Action

B Whenever the crew report that the buckets fail to modulate beyond 5° during transonic acceleration it is unlikely that changing any component other than the air motor will cure the defect. If an air motor is not available, the defect should be actioned as an ADD and a Note to Crew entered.
The buckets should not be locked at 10°.

TWIN SECONDARY NOZZLE - REMOVAL/INSTALLATION

1. General

The twin secondary nozzle (TSN) incorporates thrust reverse buckets, and primary nozzles, each of which is electro-pneumatically controlled. Access to the nozzle, which is secured to the aft end of the adjacent engine bays, is gained by opening and supporting the four engine bay doors on the nacelle. Removal of the nozzle necessitates removal of the two jet pipes that are associated with the nozzle, also the lower section of the nozzle fire detection system. The twin secondary nozzle can also be removed and installed in various configurations which require adjustment of the handling equipment. The positions, which are indicated on
R the adjuster tube, are:

A - Twin secondary nozzle with primary nozzles and thrust reverse buckets.

B - With primary nozzles only.

C - With thrust reverse buckets only.

D - Twin secondary nozzle only.

This procedure details the method used to remove the TSN complete with primary nozzle and reverse buckets.

2. Twin Secondary Nozzle (TSN)

A. Equipment and Materials

DESCRIPTION	PART NO.
Handling equipment	E935033000
Forward mounting	E936077000
Side lifting plate - 2 off	525-910-637
Layby trolley/stand	9970-541-049
C-spanner	E925145000
R C-spanner	E925146000
C-spanner	E925149000

DESCRIPTION	PART NO.
Torque handle	LTC 2
Circuit breaker safety clips	
Aeroshell grease 16 (Ref. 20-30-00, No.51)	-
Torque spanners R Range - 0-100 lbf in (0-1.13 mdaN) R 50-150 lbf in (0.56-1.69 mdaN) R 400-450 lbf in (4.52-5.08 mdaN) R 500-550 lbf in (5.65-6.21 mdaN) R 600-725 lbf in (6.78-8.19 mdaN)	
R Torq-set screwdriver Range 0-25 lbf in (0-0.28 mdaN)	-
Pneumatic vibration screwdriver Range 0 to 60 lbf in (0-0.64 mdaN)	-
Pneumatic impact wrench and appropriate head for panel fastener removal	-
R High temperature resistant nimonic R wire 0.8 mm (0.031 in) dia. R	DTD747
R Approved pipe and hose blanks.	-

B. Prepare to Remove TSN (Ref. Fig. 401)

CAUTION: TO MAINTAIN BALANCE DURING REMOVAL/INSTALLATION ENSURE THAT EACH SIDE OF THE TWIN SECONDARY NOZZLE IS FITTED TO THE SAME COMPONENT STANDARD.

R (1) Trip the following breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
ENG 1			
BAY COOLING FLAP CONT AND IND	3-213	1K231	F 1

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
SEC AIR DOOR MTR SUP	2-213	1K247	C10
LP VALVE SUP 1	15-216	1Q1	C 1
LP VALVE SUP 2	16-215	1Q2	-
REHEAT CONT	15-216	1K1542	E 9
BUCKET CONT UNIT SUP	14-215	1K1132	E12
WIND DOWN CONT SUP 1	5-213	1K1101	B 1
WIND DOWN CONT SUP 2	1-213	1K1108	C 7
R REV BUCKET POS IND R	5-213	1E121	A 3
REV THRUST ASOV CONT	3-213	1K334	G 3
PP MGT LTS SUP	5-213	1E461	D 1
C/BLEED VALVE CONT	1-213	1H861	D12
FIRE DETECT SUP 1	5-213	1W151	B15
FIRE DETECT SUP 2	1-213	1W152	R19
ENG % AREA(AJ) IND	14-215	1E81	C13
ENG 2			
BAY COOLING FLAP CONT AND IND	1-213	2K231	D 3
SEC AIR DOOR MTR SUP	2-213	2K247	F10
LP VALVE SUP 1	15-216	2Q1	F 2
LP VALVE SUP 2	15-215	2Q2	C19
REHEAT CONT	15-215	2K1542	D15
BUCKET CONT UNIT SUP	13-215	2K1132	G14
WIND DOWN CONT SUP 1	1-213	2K1101	F 4
WIND DOWN CONT SUP 2	5-213	2K1108	C 1
REV BUCKET POSN IND	1-213	2E121	B 7
REV THRUST ASOV CONT	1-213	2K334	D 7
PP MGT LTS SUP	1-213	2E461	E 3
C/BLEED VALVE CONT	5-213	2H861	F 8
FIRE DETECT SUP 1	1-213	2W151	Q19
FIRE DETECT SUP 2	5-213	2W152	B17

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
R ENG % AREA(AJ) IND	13-215	2E81	D13
ENG 3			
BAY COOLING FLAP CONT AND IND	1-213	3K231	D 4
SEC AIR DOOR MTR SUP	4-213	3K247	A19
LP VALVE SUP 1	15-216	3Q1	F 1
LP VALVE SUP 2	15-215	3Q2	C20
REHEAT CONT	15-215	3K1542	D16
BUCKET CONT UNIT SUP	13-216	3K1132	C 6
WIND DOWN CONT SUP 1	1-213	3K1101	F 5
WIND DOWN CONT SUP 2	5-213	3K1108	C 2
REV BUCKET POS IND	1-213	3E121	B 8
REV THRUST ASOV CONT	1-213	3K334	D 8
PP MGT LTS SUP	1-213	3E461	E 4
C/BLEED VALVE CONT	15-215	3H861	B 4
FIRE DETECT SUP	1-213	3W151	Q20
FIRE DETECT SUP 2	5-213	3W152	B18
R ENG % AREA(AJ) IND	13-216	3E81	B 6
ENG 4			
BAY COOLING FLAP CONT AND IND	3-213	4K231	F 2
SEC AIR DOOR MTR SUP	4-213	4K247	F19
LP VALVE SUP 1	15-216	4Q1	C 2
LP VALVE SUP 2	16-215	4Q2	-
REHEAT CONT	15-216	4K1542	E10
BUCKET CONT UNIT SUP	14-216	4K1132	C 6
WIND DOWN CONT SUP 1	5-213	4K1101	B 2
WIND DOWN CONT SUP 2	1-213	4K1108	C 8
REV BUCKET POS IND	5-213	4E121	A 4
REV THRUST	3-213	4K334	G 4

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SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
ASOV CONT			
PP MGT LTS SUP	5-213	4E461	D 2
C/BLEED VALVE CONT	15-216	4H861	B24
R FIRE DETECT SUP 1	5-213	4W151	B16
FIRE DETECT SUP 2	1-213	4W152	R20
ENG % AREA(AJ) IND	14-216	4E81	B 6

(2) Display a suitable placard on the engine starting panel, indicating that personnel are working on the engines and in the TSN area.

(3) Open and support the left and right side engine bay doors of the relevant nacelle (Ref. 71-00-00, Servicing).

(4) Disconnect the TSN fire detection system (Ref. Fig. 401).

CAUTION: DO NOT BEND OR KINK THE FIRE WIRE WHEN HANDLING.

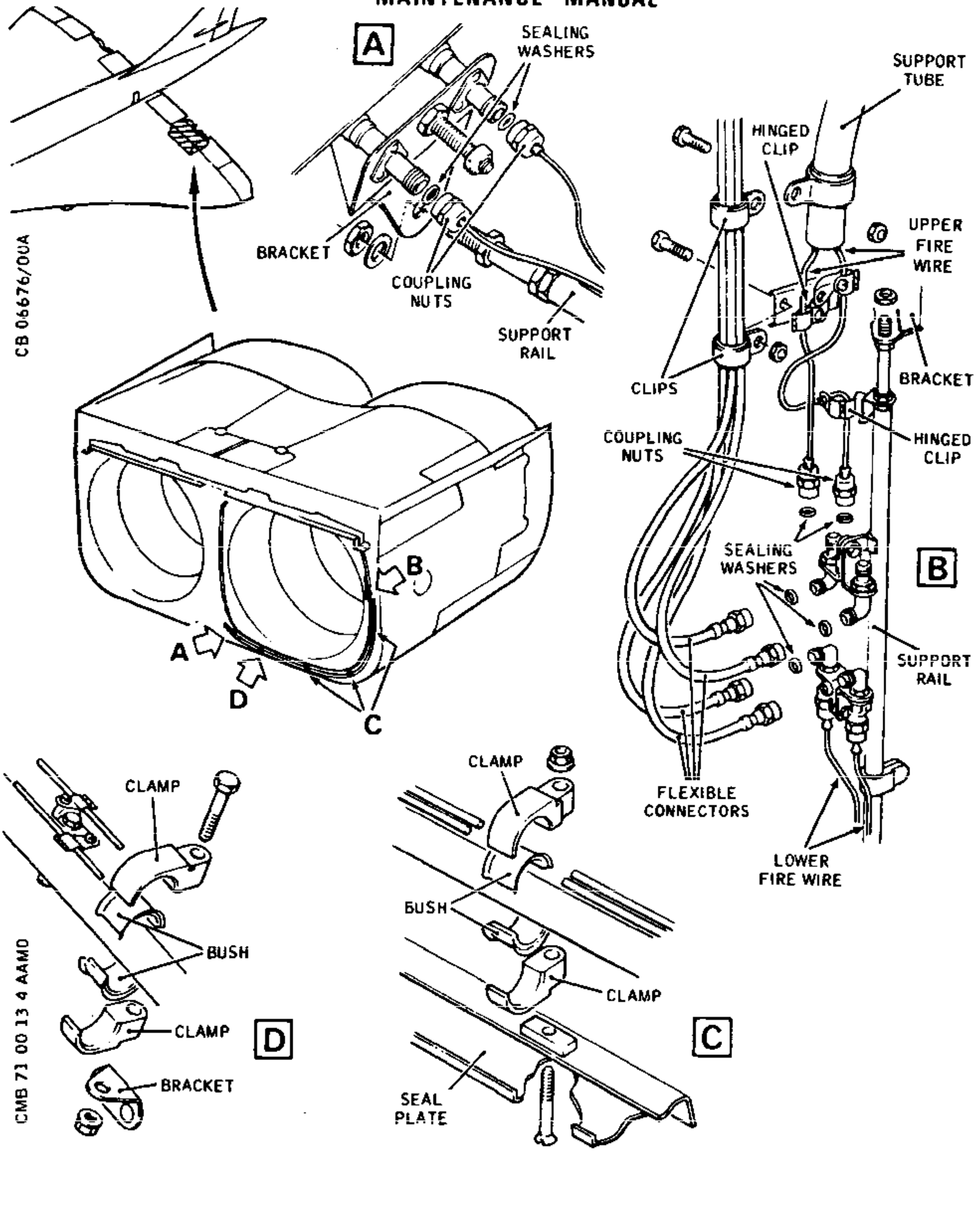
(a) Disconnect the flexible connectors from the lower fire wire; discard the sealing washers.

(b) Remove the clips and bushes securing the flexible connectors to the upper fire wire.Support the tube and bracket and temporarily secure the connectors clear of the TSN.

R (c) Remove the rear fire sensing elements.
R (Bottom Assembly) from the TSN:

(c1) Disconnect the coupling nuts at the fitting adjoining the TSN centre wall; discard the sealing washers. Remove the nut securing the support rail to the bracket.

(c2) Disconnect the coupling nuts at the bracket adjoining the TSN outboard wall; discard the sealing washers. Remove the nut securing the support rail to the bracket.



TSN Lower Fire Wire - Removal/Installation
R Figure 401

(c3) Disengage the upper fire wire from the hinged clip.

(c4) Support the lower fire wire, and remove the nuts and bolts securing the clamps to the seal plate and to the bracket on the TSN. Remove the support rail complete with fire wire.

(5) Remove the jet pipes from the appropriate engine bays (Ref. 78-11-01, Removal/Installation).

(6) Disconnect the PFCU from the inner and centre elevons (Ref. 27-31-61 and 27-31-62; pivot the elevons downward).

C. Remove TSN (Ref. Fig. 402, 403 and 404)

NOTE: Connections and fittings are similar for left and right engine bays.

(1) Remove the bolts and seal retainers securing the wing/nozzle flexible joint seal to the upper surface of the TSN.

R (2) Remove the torq-set screws securing the TSN lower seal to the angled TSN bracket.

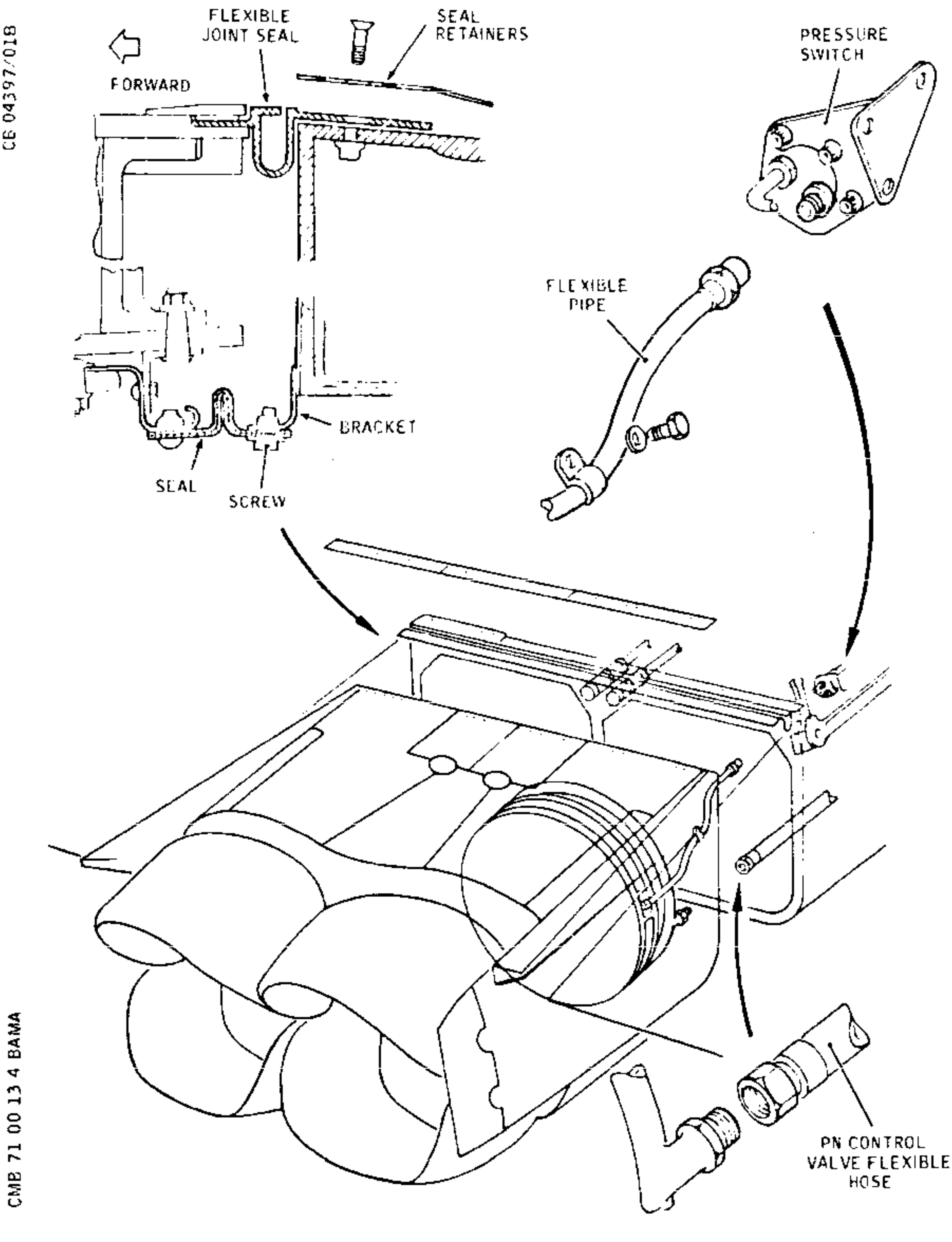
(3) Electrically disconnect the TSN. (Ref. Fig. 403)

(a) Remove the access panels 418AT and 427AT or 438AT and 447AT from the top surface of the nozzle.

CAUTION: USE A PNEUMATIC IMPACT WRENCH WITH AN APPROPRIATE SCREWDRIVER HEAD FOR REMOVAL OF PANEL FASTENERS OTHERWISE DAMAGE TO FASTENER HEAD MAY OCCUR.

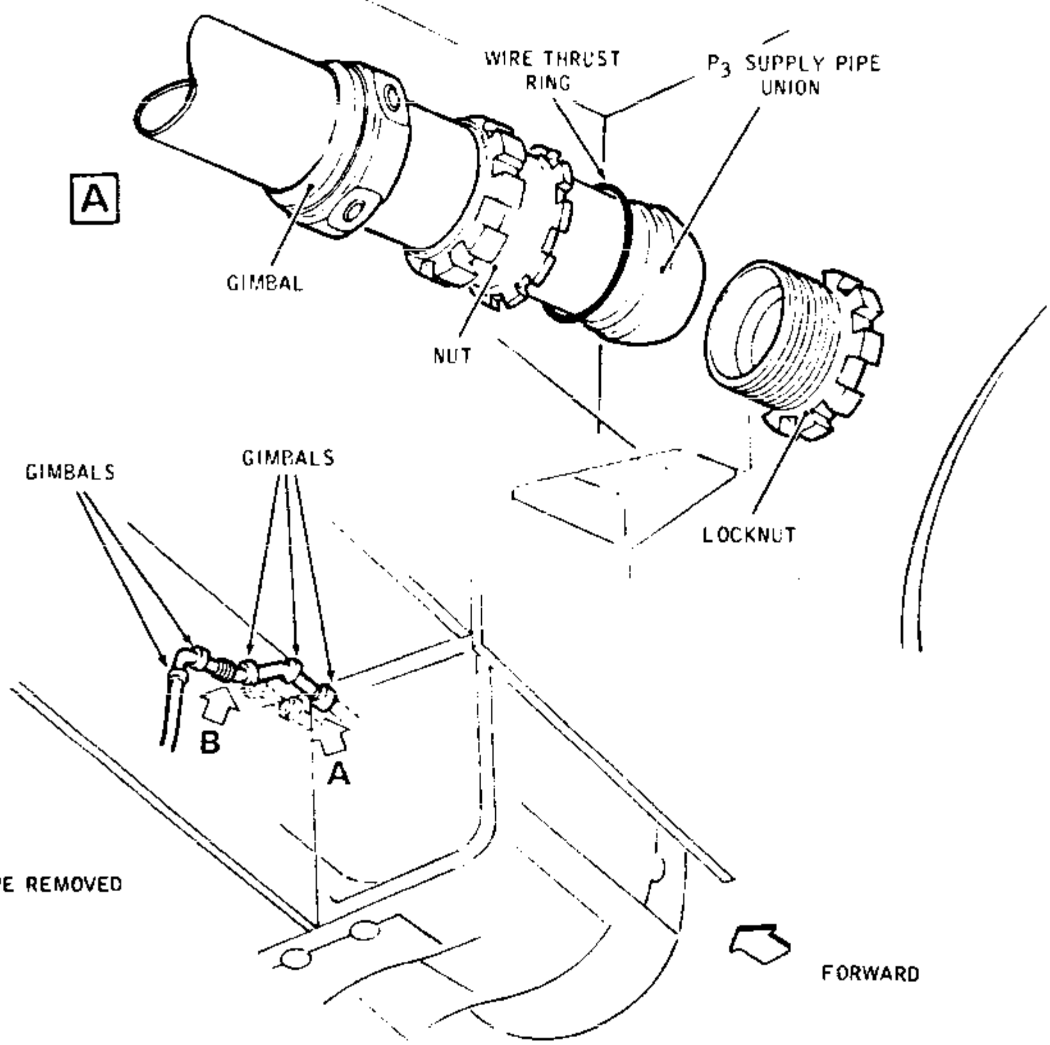
R (b) Remove the nuts, bolts and clips securing the electrical cables to the brackets mounted on the TSN bulkhead.

(c) Disconnect the two electrical plugs from the receptacles on each bucket motor.



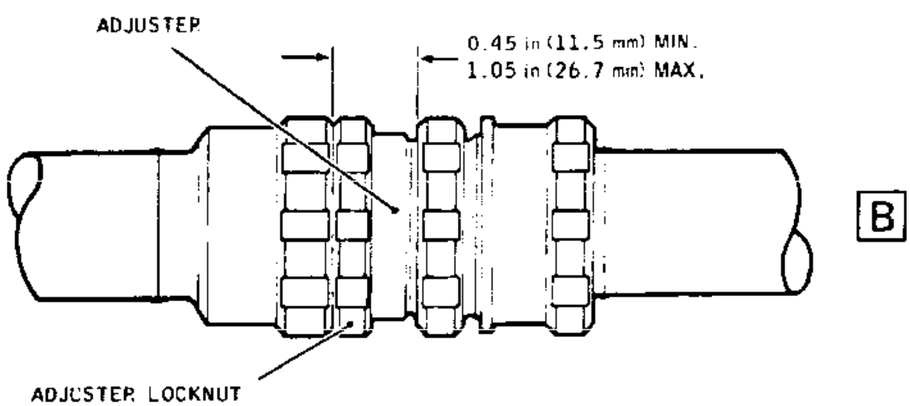
TSN Connections (Sheet 1 of 2)
Figure 402

CB 08675/00A

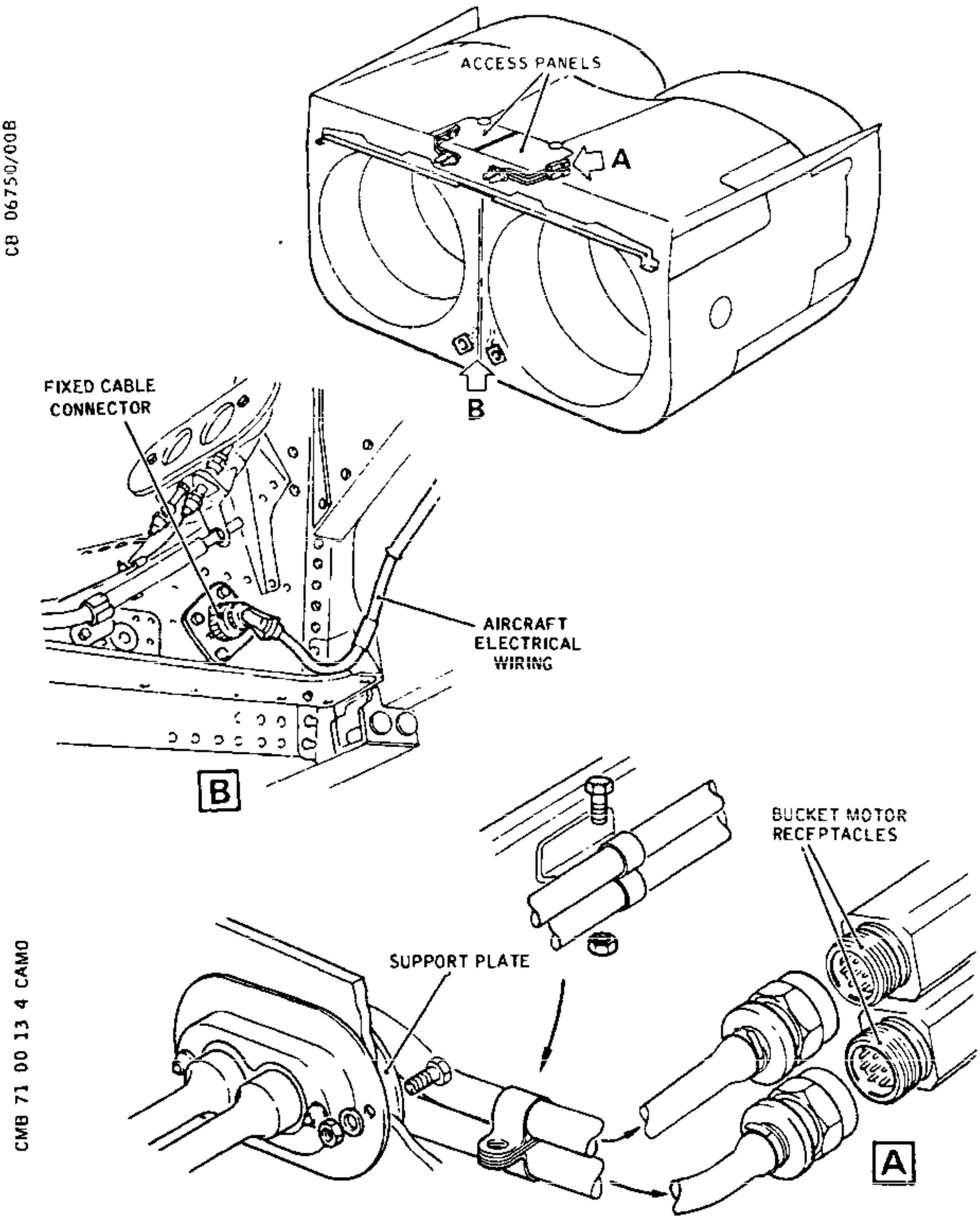


NOTE:
JET PIPE REMOVED

CMB 71 00 13 4 BAMB

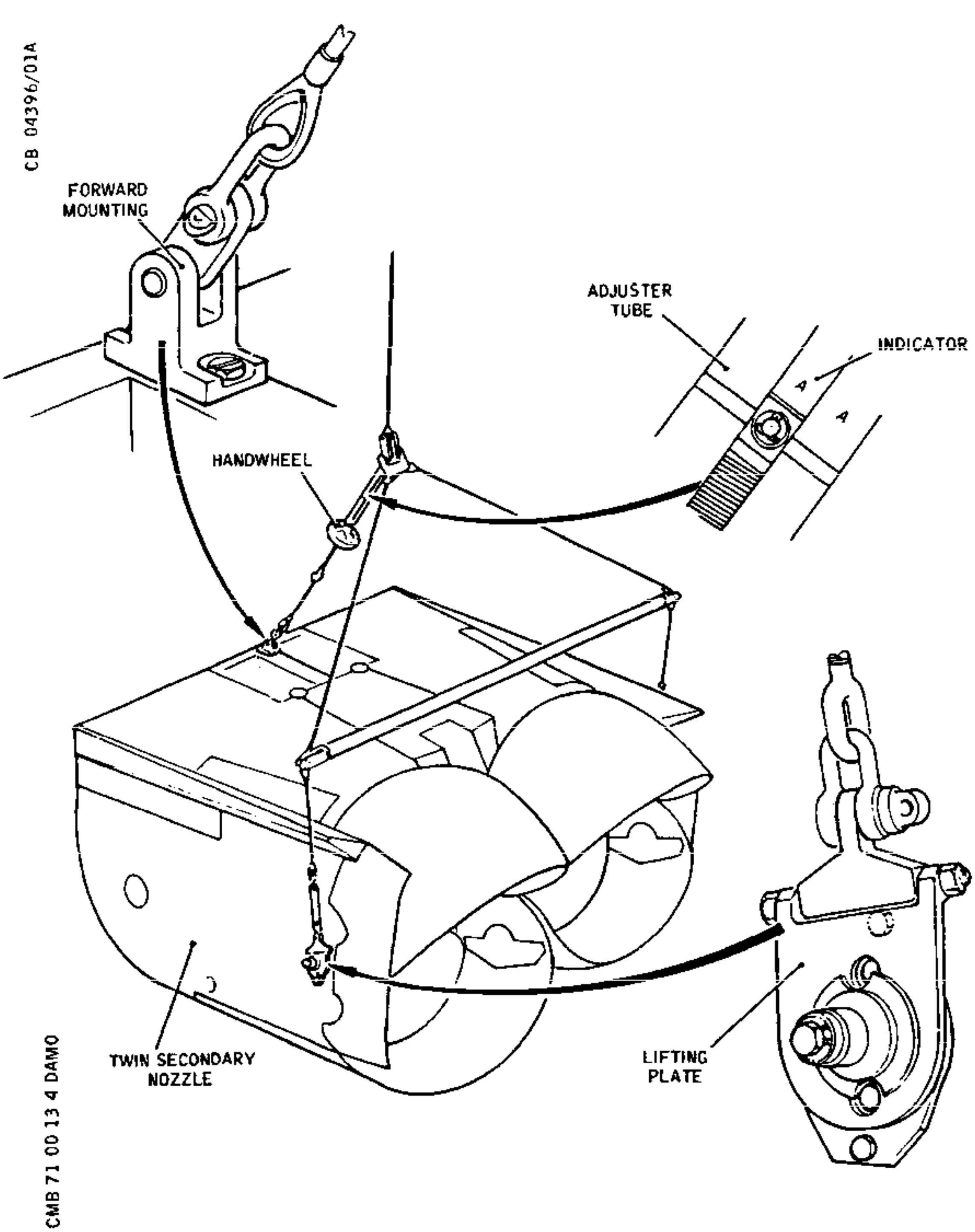


TSN Connections (Sheet 2 of 2)
Figure 402



R

TSN Electrical Connections
Figure 403



TSN Handling Equipment
Figure 404

ENGINE NO.	ELECTRICAL PLUG IDENT
1	1U4025; 1U4026
2	2U4025; 2U4026
3	3U4025; 3U4026
4	4U4025; 4U4026

(d) Remove the nuts, washers and bolts securing the support plate to the TSN. Manoeuvre and withdraw the electrical cables from the nozzle and temporarily secure them in the nacelle.
R (Ref. Detail A).

R (e) Disconnect the two nozzle area transducer
R electrical plugs, one each side of the
R centre wall, from the receptacles at the
R bottom of the TSN Structure.(Ref.Detail B).

(4) Disconnect the reheat detection flexible pipe.

(a) Remove the bolt and washer securing the clip to the exhaust diffuser.

(b) Disconnect the pipe union nut from the pressure switch.

(5) Disconnect the P3 supply pipe.

(6) Disconnect the flexible hose from the PN control valve.

(7) Secure the handling equipment to the TSN.

(a) Operate the handwheel to move the indicator to point 'A' on the adjuster tube.

(b) Attach the handling equipment to a hoist; operate the hoist to suspend the equipment above the TSN.

(c) Secure the forward mounting to the top surface of the TSN with two bolts.

(d) Secure the two side lifting plates to the exterior face of the left and right nozzles

respectively with four bolts.

(e) Operate the hoist to take the weight of the TSN.

(8) Secure guide ropes to each of the lifting shackles on the handling equipment.

(9) Gain access to the bolt and spigot securing the TSN to the nacelle centre wall by removing the top and bottom heat shields (Ref. Fig. 405).

(10) Release the TSN from the nacelle.

(a) Remove the spigots from the centre wall lower link fitting.

(b) Remove the spigots from the left and right drag struts.

(c) Remove the bolt from the centre wall upper link fitting.

(11) Move the hoist rearward and, using the guide ropes, manoeuvre the TSN clear of the nacelle.

WARNING: ENSURE THAT PERSONNEL AND EQUIPMENT ARE CLEAR OF THE AREA SURROUNDING THE TSN BEFORE OPERATING THE HOIST.

R (12) Lower the TSN and secure it on an approved layby
R trolley/stand.

(13) Lower the hoist and remove the handling equipment and the guide ropes from the TSN.

(14) Fit blank covers to all electrical connectors, exposed pipe and hose ends in the nacelle and the TSN.

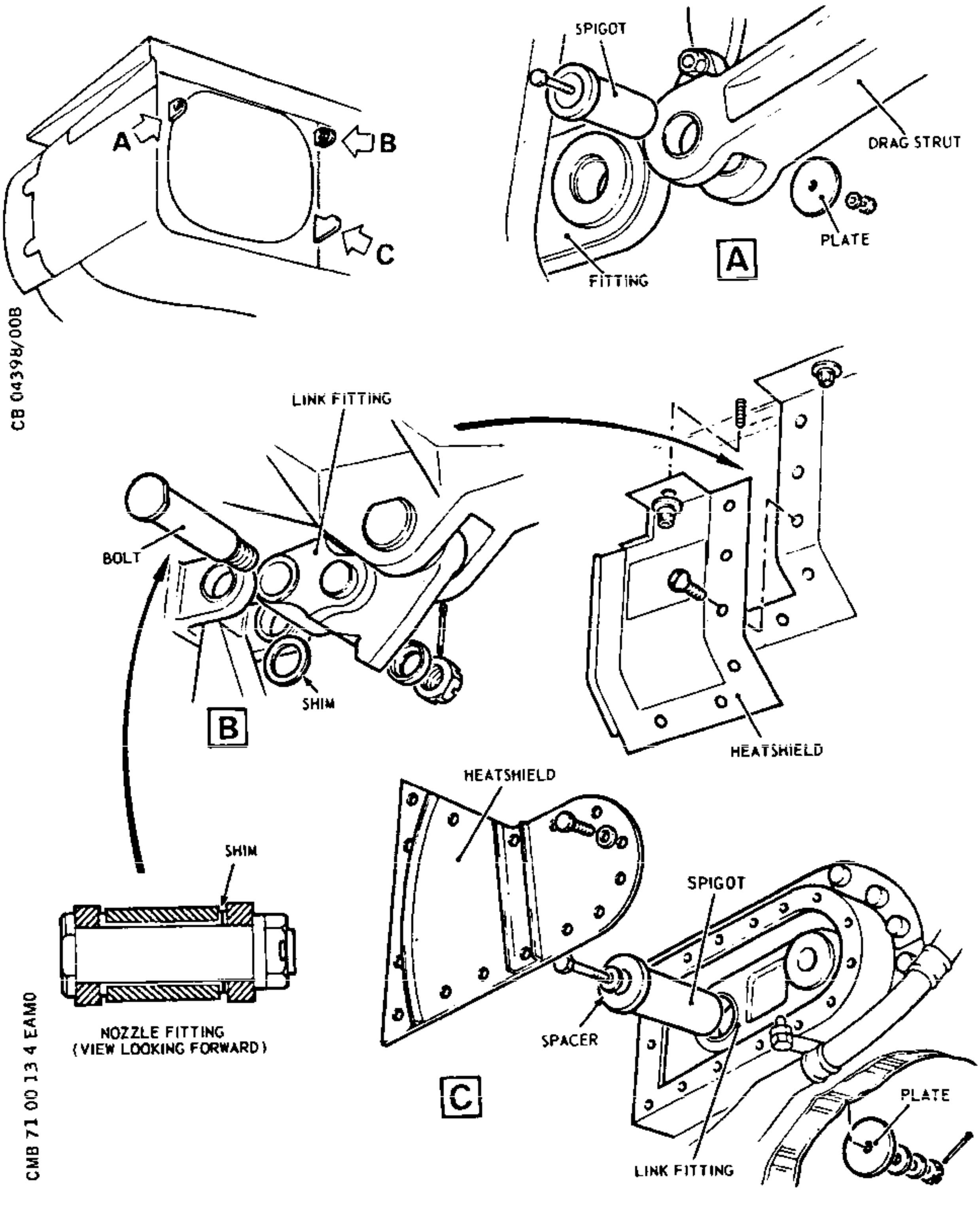
D. Prepare to Install TSN

(1) Check that the safety precautions taken during removal have not been cancelled.

R (2) If a replacement TSN is to be installed, transfer the
R rear fire sensing elements (Top Assembly) to the
R replacement TSN (Ref.26-11-00, Removal/Installation).

E. Install TSN

(1) Support the handling equipment above the TSN;



Attachment Fittings and Heat Shields
R Figure 405

secure it to the nozzle.

(2) Secure guide ropes to each of the lifting shackles on the handling equipment.

(3) Operate the hoist and, controlling TSN movement with the guide ropes, align the TSN with the nozzle mounts on the centre wall upper and lower fittings, and with the left and right drag struts.

R (4) Secure the TSN to the nacelle (Ref. Fig. 405):

(a) Secure the centre wall upper link fitting with
R a bolt, washer and nut. Torque-tighten the nut to 500-530 lbf in (5.65-5.99 mdaN). If the gap between the link fitting and nozzle mounting is greater than 0.015 in (.38 mm), interpose a shim between the link fitting and the nozzle mounting. Lock the nut with a split pin.

(b) Secure the centre wall lower link fitting with a spigot, spacer bolt, plate, washer and nut.
R Torque-tighten the nut to 60-70 lbf in
R (0.67 - 0.79 mdaN) and lock it with a split pin.

(c) Secure each nozzle fitting to the associated drag strut with a spigot, bolt, plate, washer
R and nut. Torque-tighten each nut to 60-70 lbf
R in (0.67-0.79 mdaN) and lock it with a split pin.

(5) Operate the hoist to lower the handling equipment until tension in the cables is released; remove the equipment, and guide ropes from the TSN (Ref. Fig. 404).

R (6) Install the heatshields (Ref. Fig. 405):

(a) Secure the heatshield (Detail B) with nuts and
R washers at the top and with screws elsewhere.
R Torque-tighten the nuts to 20 lbf in (0.23 mdaN)
R and slacken back one complete turn. Torque-
R tighten the screws to between 12 and 15 lbf in
R (0.14 and 0.17 mdaN).

(b) Secure heatshields (Detail C) with bolts and
R washers, torque-tighten to between 30-40 lbf in (0.34 - 0.45 mdaN).

(7) Connect the twin secondary nozzle pipes to the
R associated nacelle pipes (Ref. Fig. 402):

(a) Remove the blanks and connect the P3 supply pipe union nut to the pipe union sleeve. Using the C-spanner to restrain the sleeve and the spanner adapter, complete with the torque handle, to turn the nut, torque-tighten the joint to between 600 and 710 lbf in (6.78 - 8.02 mdaN); (Ref. Fig. 402) Detail A.

(b) Check that the gimbals lie normal to the pipe and that the adjuster setting is within the limits shown in (Ref. Fig. 402) Detail 'B'. If necessary reset the adjuster to establish these requirements. Torque-tighten the adjuster locknut to 50-55 lbf in (0.57 - 0.62 mdaN) and wirelock in accordance with 20-21-13.

(c) Remove the blank and connect the flexible hose to the LPN control valve, torque-tighten the union nut to between 400 and 440 lbf in (4.52 - 4.97 mdaN).

(d) Connect the reheat detection pipe:

(d1) Remove the blanks.

(d2) Connect the flexible pipe union nut to the pressure switch. Torque-tighten the nut to between 85 and 150 lbf in (0.96 and 1.70 mdaN). Lock the union nut with wire in accordance with 20-21-13.

(d3) Secure the pipe clip to the exhaust diffuser with a washer and bolt. Torque tighten the bolt to between 70 and 80 lbf in (0.79 and 0.90 mdaN).

(8) Electrically connect the TSN (Ref. Fig. 403):

(a) Thread the electrical cables into the TSN, connect the electrical plugs to the associated receptacles on each bucket motor, ensuring that the connections are made in accordance with the cable identification and the applicable wiring diagram.

(b) Secure the cables to the TSN with a support plate, bolts, washers and nuts. Torque-tighten each nut to between 20 and 30 lbf in (0.22 and 0.34 mdaN).

(c) Secure the cables to the brackets on the TSN

bulkhead with clips, bolts and nuts, torque-tighten each nut to between 12 and 15 lbf in (0.14 and 0.17 mdaN) and lock it with a split pin.

(d) Connect the two nozzle area transducer electrical plugs, one each side of the centre wall to their associated receptacles on the TSN structure. Ensure that the connections are made in accordance with the cable identification and the applicable wiring diagram.

(9) Check that the area is clean and fit access panels 418 AT and 427 AT or 438 AT and 447 AT. Torque-tighten each fastener, using the pneumatic vibration screwdriver, pre-set to 53 lbf in (0.6 mdaN).

CAUTION: TAKE CARE NOT TO DAMAGE FASTENER HEADS.

(10) Secure the wing/nozzle flexible joint seal to the upper surface of the TSN (Ref. Fig.402):

(a) Lubricate the bolts with Aeroshell grease 16 (Ref. 20-30-00, No.51).

(b) Attach the upper seal to the TSN with seal retainers and bolts.

(c) Torque-tighten the large dia. bolts to between 70 and 80 lbf in (0.79 and 0.90 mdaN).

(d) Torque-tighten the small dia. bolts to between 40 and 45 lbf in (0.45 and 0.51 mdaN).

RB (11) Prepare the TSN lower seal for assembly as follows:

RB (a) Degrease the inconel wire braided side of the seal
RB using Ambersil L030 and leave to evaporate.

RB (b) Apply a smooth brush coat of RTV 116 to the wire
RB braided side approximately 0.005 in (0.127 mm) thick.

RB (c) Leave to cure for four hours prior to assembly in a
RB temperature of at least 15°C.

RB (12) Assembly of the TSN lower seal.

RB (a) On assembly apply a bead of RTV 116 to the seal strip
RB on the TSN and the spar 72 side.

RB (b) Apply a bead of RTV 116 to the ends of the seal strip
RB where they butt up to the end seals on the TSN.

RB (c) Secure the TSN lower seal to the TSN angled bracket.
RB Torque-tighten the screws to between 12 and 15 lbf in
RB (0.14 and 0.17 mdaN).

RB (d) After curing, do a visual inspection to check that no
RB gaps exist. Use torch light on the inside of the TSN
RB nozzles to confirm by visual inspection of the outside
RB that no holes exist for hot gas leakage.

R F. Conclusion

(1) Install the left and right jet pipes (Ref. 78-11-01, Removal/Installation).

(2) Connect the TSN fire detection system (Ref. Fig.401).

CAUTION: DO NOT BEND OR KINK THE FIRE WIRE WHEN HANDLING.

(a) Install the rear fire sensing element. (Bottom Assembly).

NOTE: Coupling nuts are engraved A and B.

a1) Engage the support rail with the brackets and secure it with washers and nuts.

a2) Attach the support rail to the nozzle seal plate and to the bracket with bushes, clamps, bolts and nuts. Torque-tighten the nuts at the brackets to between 50 and 60 lbf in (0.57 and 0.68 mdaN) and lock the nuts together in pairs with wire in accordance with 20-21-13. Torque-tighten the nuts securing the clamps to between 30 and 40 lbf in (0.339 and 0.452 mdaN).

a3) Assemble a new sealing washer to each coupling and connect the coupling nuts at the fitting adjoining the nozzle centre wall.

a4) Assemble a new sealing washer to each coupling and connect the coupling nuts at the bracket adjoining the nozzle outboard wall.

a5) Engage the fire wires with the hinged clip and secure the clip.

a6) Torque-tighten each coupling nut to between 80 and 100 lbf in (0.9 and 1.13 mdaN).

(b) Connect the flexible connectors:

b1) Assemble a new sealing washer to each coupling and connect the coupling.

b2) Secure the flexible connectors to the upper fire wire with bushes, clips, bolts washers and nuts. Torque-tighten each nut to between 60 and 70 lbf in (0.68 and 0.79 mdaN).

b3) Torque-tighten each coupling nut to between 80 and 100 lbf in (0.9 and 1.13 mdaN).

(3) Remove the safety clips and reset each previously tripped circuit breaker (Ref. para. 2.B.).

(4) Functionally test the systems in the TSN (Ref. 78-00-00, Adjustment/Test).

(5) Connect the PFCU to the inner and centre elevons (Ref. 27-31-61 and 27-31-62, Removal/Installation).

(6) Functionally test the overheat detection circuit insulation and resistance in the TSN (Ref. 26-21-00, Adjustment/Test).

(7) Close the left and right side engine bay doors (Ref. 71-00-00, Servicing).

(8) Remove the placard from the engine starting panel.

ENGINE BAY ROOF ARMOUR - REMOVAL/INSTALLATION

1. General (Ref. Fig.401)

This topic describes the Removal/Installation of a section of titanium armour plate in the roof of No.1 engine bay. The other sections may be removed/installed in a similar manner. To gain access to the armour plate remove the engine, air conditioning components and the relevant firewall panels.

2. Roof Armour

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner range: 0-30 lbf in (0-0.34 mdaN)	-
Corrosion resistant steel wire 0.028 in (0.71 mm) dia.	-
Circuit breaker safety clips	-

B. Prepare

(1) Remove the engine (Ref. 71-00-00, Removal/Installation).

(2) Remove the primary and secondary heat exchangers and the associated ducting (Ref. 21-12-11 and 21-12-14, Removal/Installation).

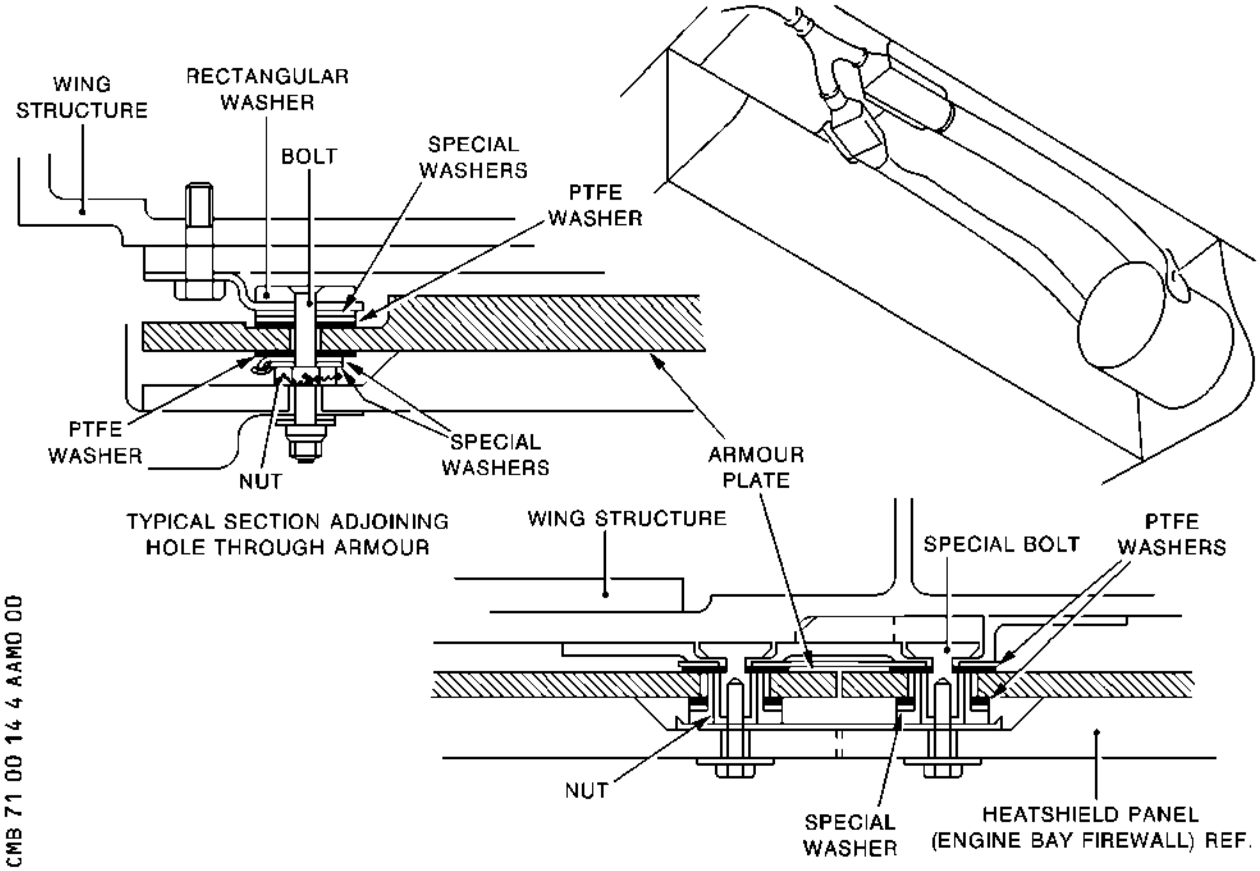
(3) Remove the relevant firewall panels (Ref. 71-32-11, Removal/Installation).

C. Remove Roof Armour (Ref. Fig.401)

(1) Remove the locking wire from the nuts.

(2) Support the section of armour and remove the nuts and special washers securing the roof armour to the wing fittings. Retain the washers and note how they are arranged.

(3) Remove the armour plate section and the PTFE and special washers. Retain the washers and note how they are arranged.



Engine Bay Roof Armour - Installation
Figure 401

D. Prepare to Install (Ref. Fig.401)

(1) Ensure that the area is clean and undamaged.

E. Install

(1) Ensure that a bolt and rectangular washer, or a threaded pin is in place in each armour plate bolting position.

(2) Secure the washers on the bolt or pin in the sequence noted on removal.

NOTE: PTFE washers are always assembled immediately above and below the armour plate.

(3) Engage the armour plate with the pins and secure with washers and nuts. Bend down the tabs on the tab washers to facilitate wire locking.

NOTE: Check along the front and rear edges of the section to ensure that there is a constant gap around the threaded pins to allow for thermal expansion. This should result in a nominal gap of 0.05 in (1.27 mm) between adjacent plates, but centralization of the holes is the more important feature.

(4) Torque tighten each nut to between 15 and 20 lbf in (0.17 and 0.23 mdaN) and lock with wire to the lug of the washers previously fitted.

F. Conclusion

(1) Install the firewall panel(s) previously removed (Ref. 71-32-11, Removal/Installation).

(2) Install the air conditioning components and ducting previously removed (Ref. 21-12-11 and 21-12-14, Removal/Installation).

(3) Install the engine (Ref. 71-00-00, Removal/Installation).

TURBINE COOLING AIR - TROUBLE SHOOTING

1. General

A. The turbine cooling air temperature indication and warning system comprises two thermocouples, an amplifier and an indicator which also includes a warning light.

The two thermocouples located to the rear of the HP turbine are connected in parallel. The output signal is taken to the amplifier which in turn provides a signal to the indicator providing temperature indication.

B. When the turbine cooling air temperature reaches a level equivalent to a pre-set datum within the amplifier a circuit is made which illuminates the warning light in the indicator, activates the master warning system and latches ON the annunciator light (No.1) on the amplifier.

C. Under normal conditions the margin between the operating temperature and the warning setting is at its minimum during supersonic cruise. Drift of warning settings or deterioration of air cooling would manifest themselves firstly at this condition.

D. Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is detailed in Table 101.

2. Preparation

R WARNING: COMPLY WITH ELECTRICAL SAFETY PRECAUTIONS DETAILED
R in 24.00.00.

A. Ensure that external electrical power supply is connected and switched on.

B. Consult Chart 101 and carry out the actions indicated to determine which of the trouble shooting charts is applicable.

R 3. Restore to Flight Standard

R A. Complete and check and necessary rectification.

R B. Reconnect all points where disconnection has been made
R during checking and rectification procedures.

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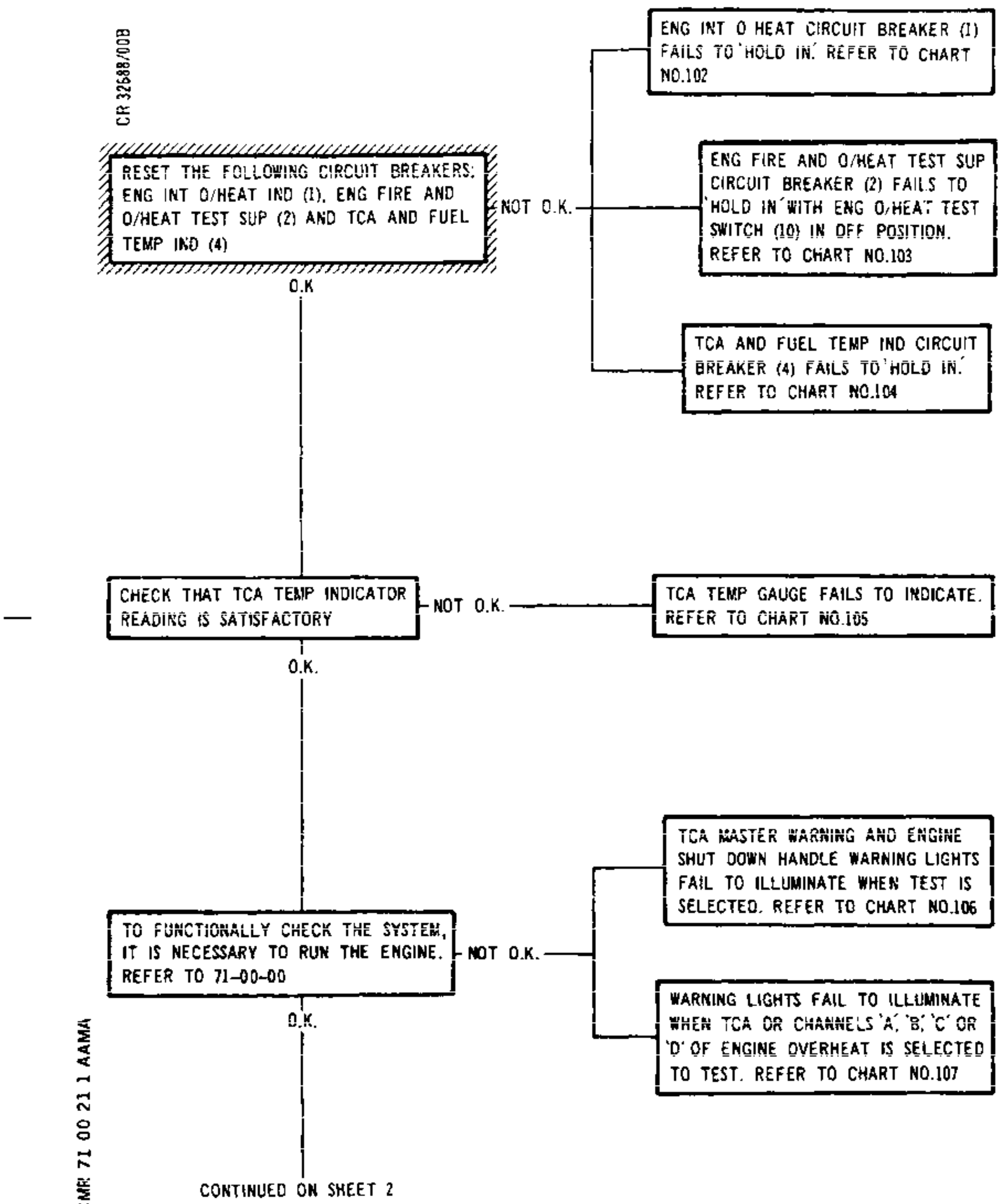

CMR 71 00 21 1 AAMA

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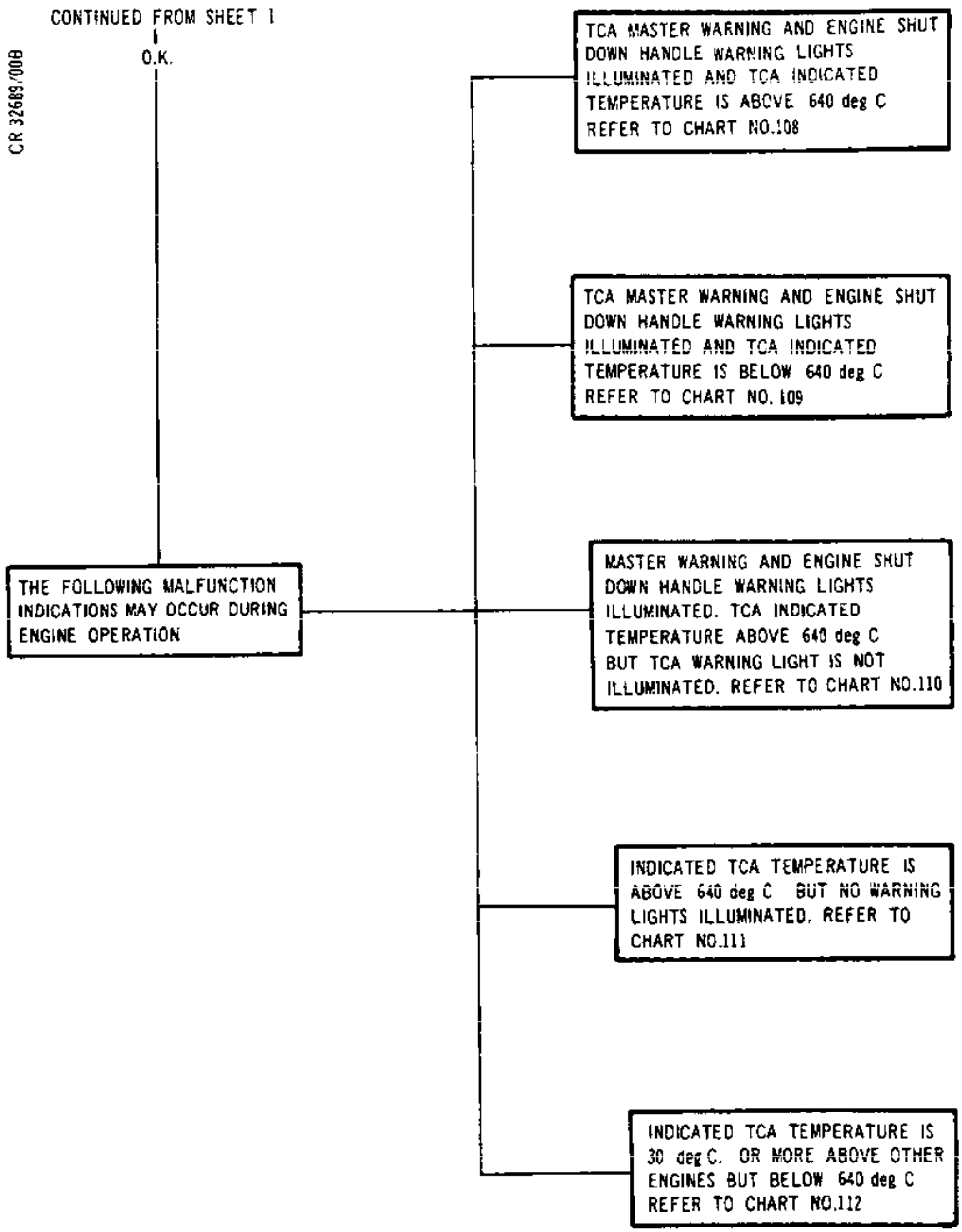
Chart 101 (Sheet 1 of 2)

CR 32689/008



CMR 71 00 21 1 AAMB

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Chart 101 (Sheet 2 of 2)

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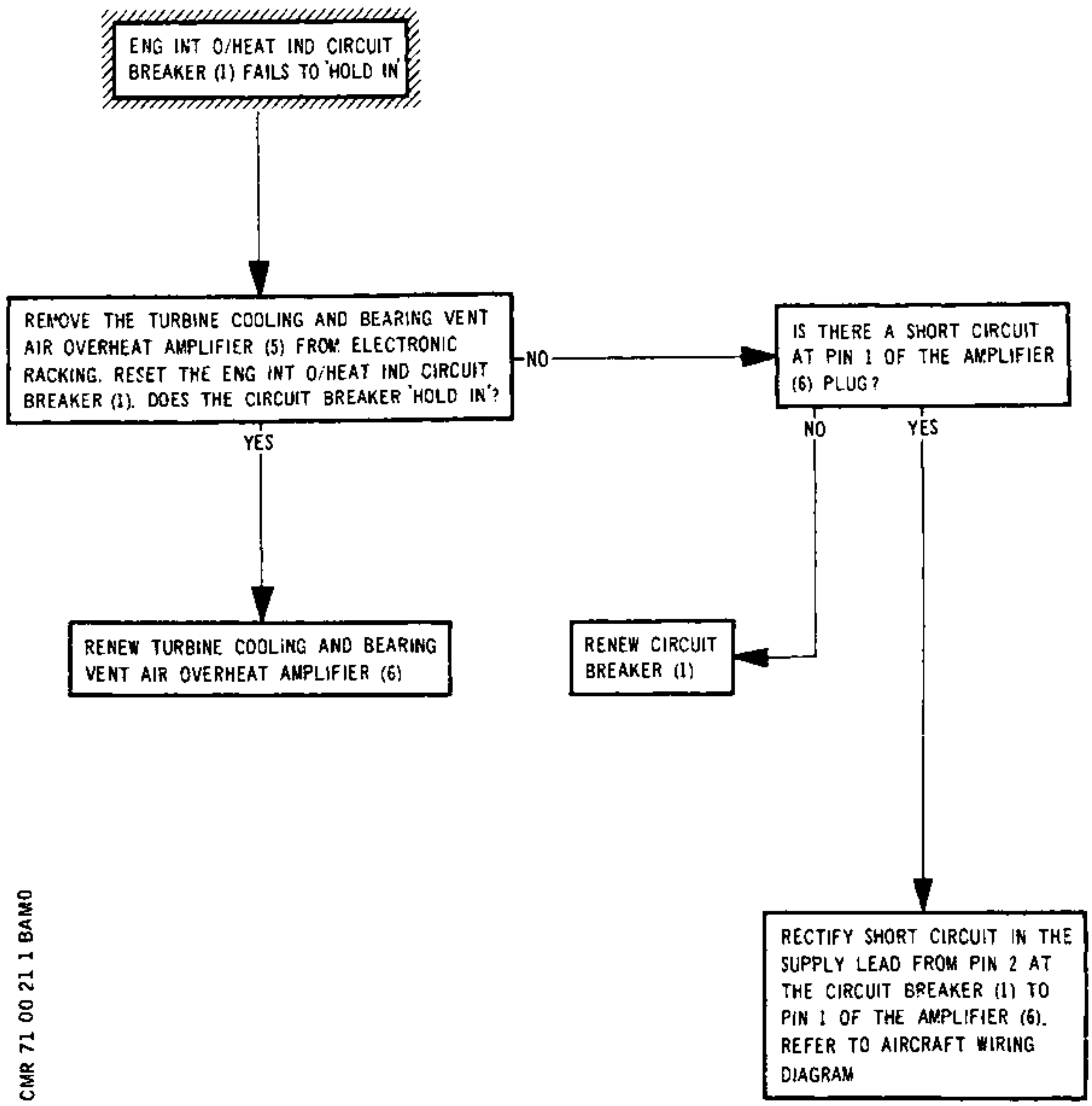
GROUND EQUIPMENT

DESCRIPTION

GROUND POWER SUPPLY (115 V a.c.)

MULTI-TEST METER



CMR 71 00 21 1 BAM0

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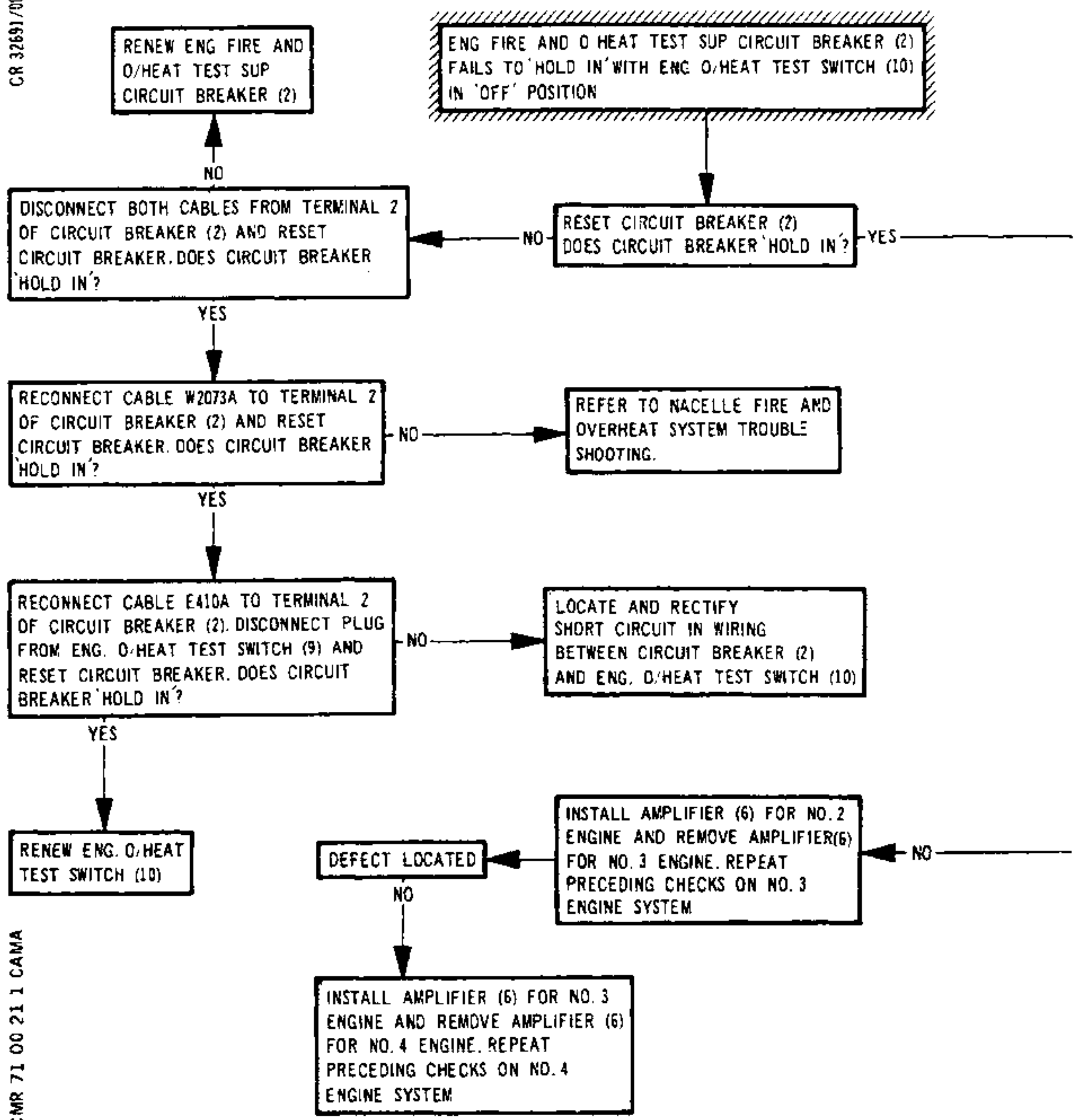
Chart 102

NOTE: THE ENG FIRE AND O/HEAT TEST SUP CIRCUIT BREAKER (2) ALSO SUPPLIES THE ENG. O/HEAT TEST SWITCH (10)

CR 32691/00B



CMR 71 00 21 1 CAMA

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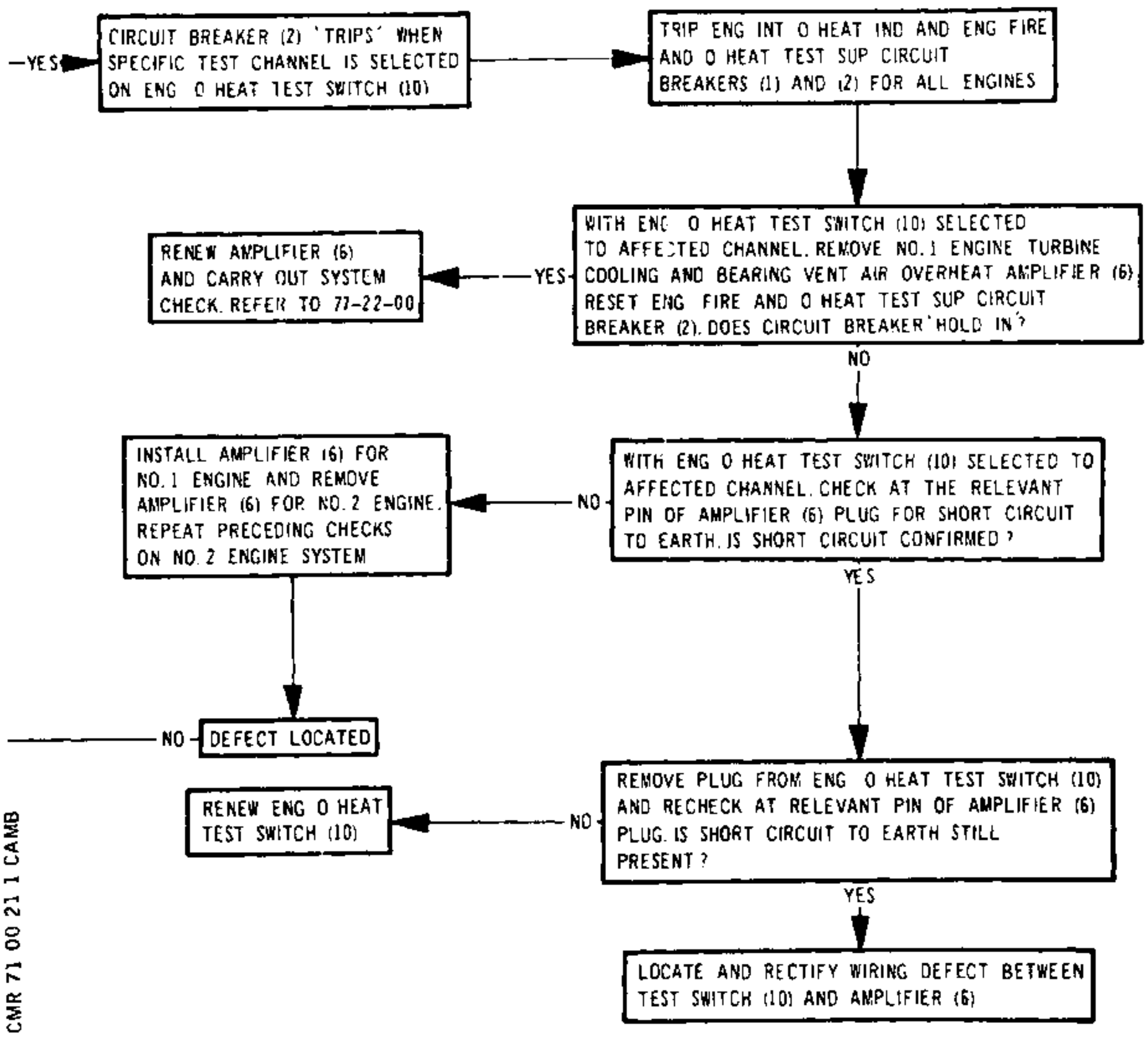
Chart 103 (Sheet 1 of 2)

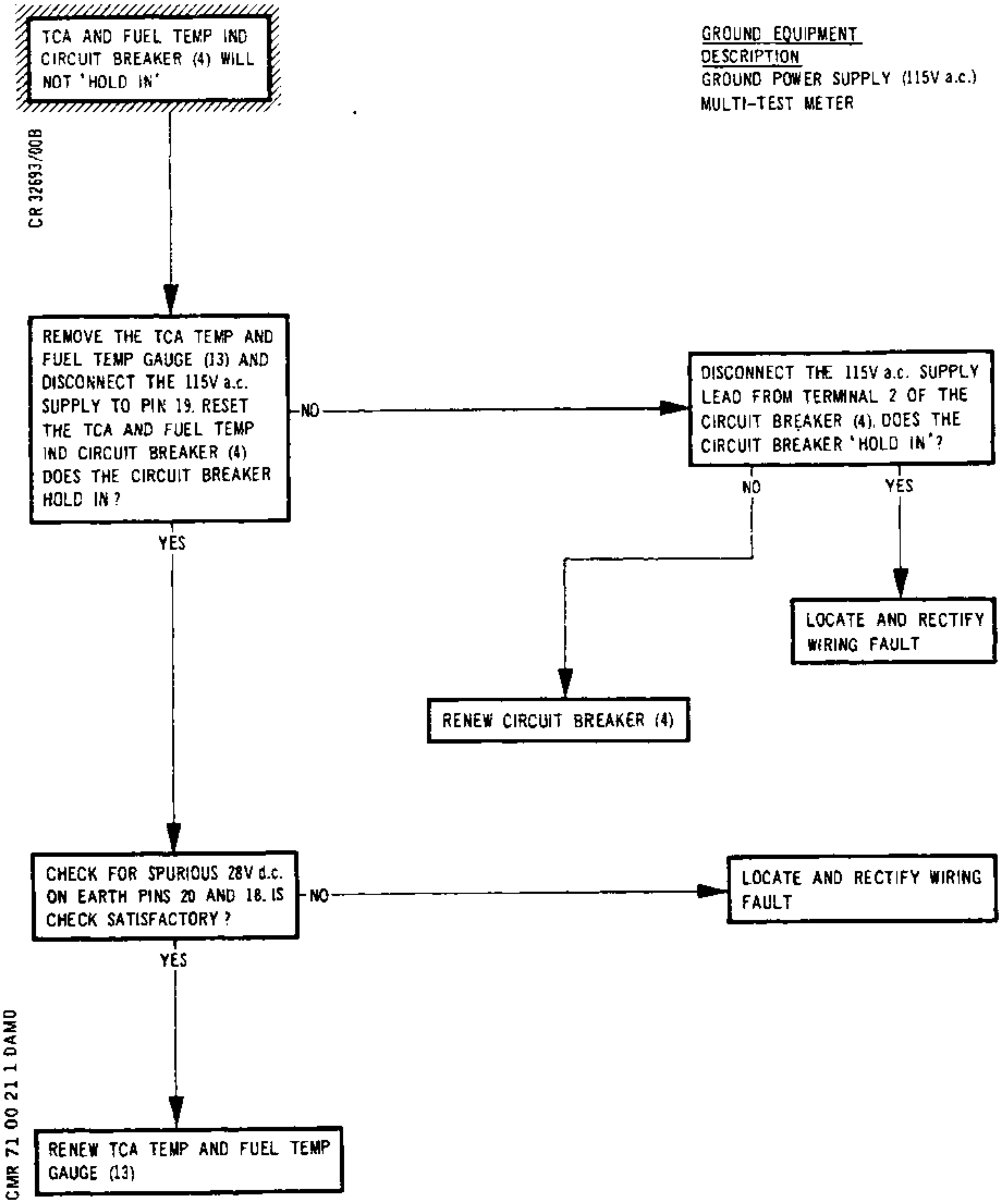
GROUND EQUIPMENT DESCRIPTION
GROUND POWER SUPPLY (28V d.c.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 21 1 CAMB

Chart 103 (Sheet 2 of 2)

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (115V a.c.)
MULTI-TEST METER



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CMR 71 00 21 1 DAMD

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Chart 104

NOTE: THE FUEL TEMP INDICATOR IS A COMBINED GAUGE AND ALSO INDICATES TCA TEMP

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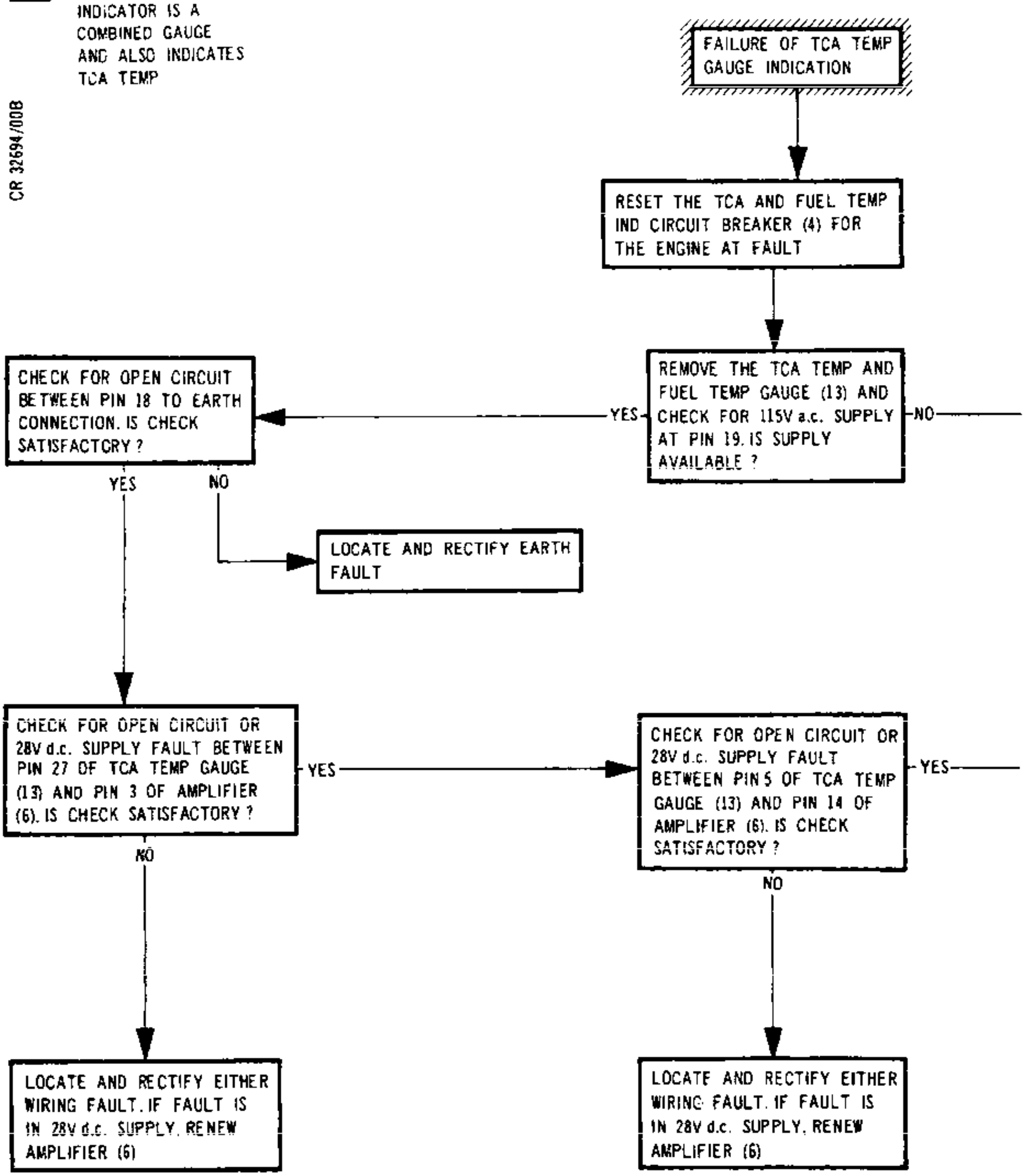

CMR 71 00 21 1 EAMA

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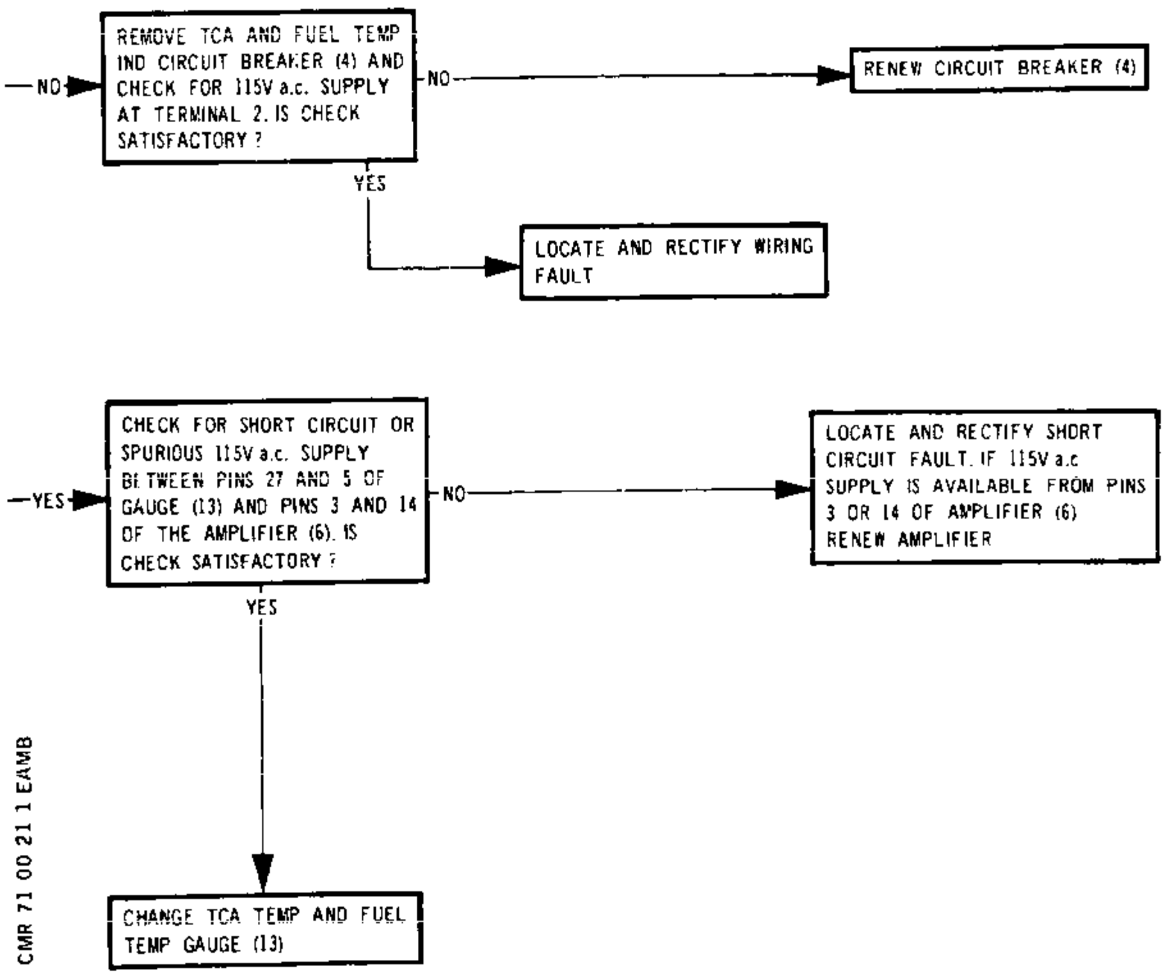
Chart 105 (Sheet 1 of 2)

GROUND EQUIPMENT

DESCRIPTION

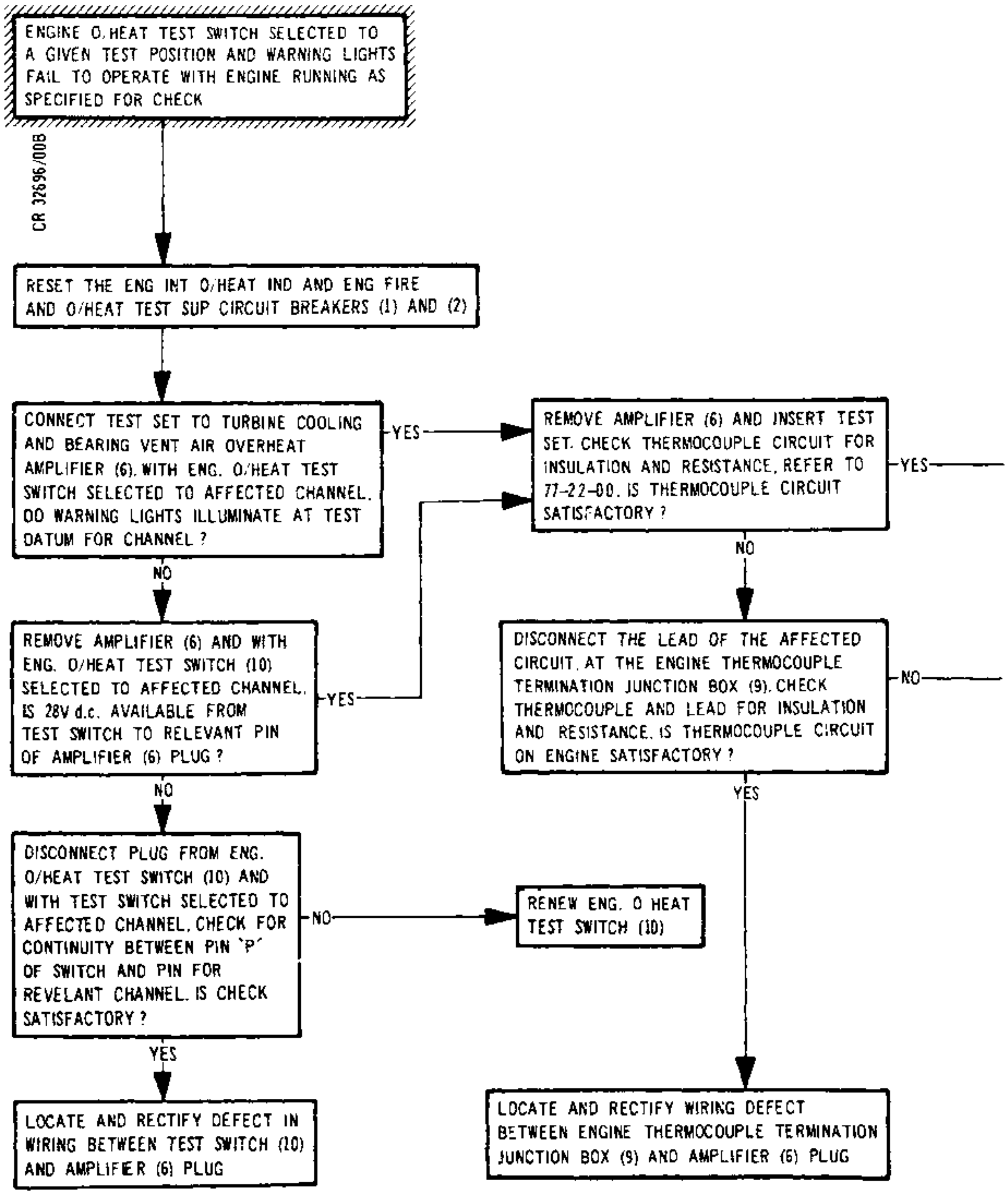
GROUND POWER SUPPLY (115V a.c.)

MULTI-TEST METER



CMR 71 00 21 1 EAMB

Chart 105 (Sheet 2 of 2)



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CMR 71 00 21 1 FAMA

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Chart 106 (Sheet 1 of 2)

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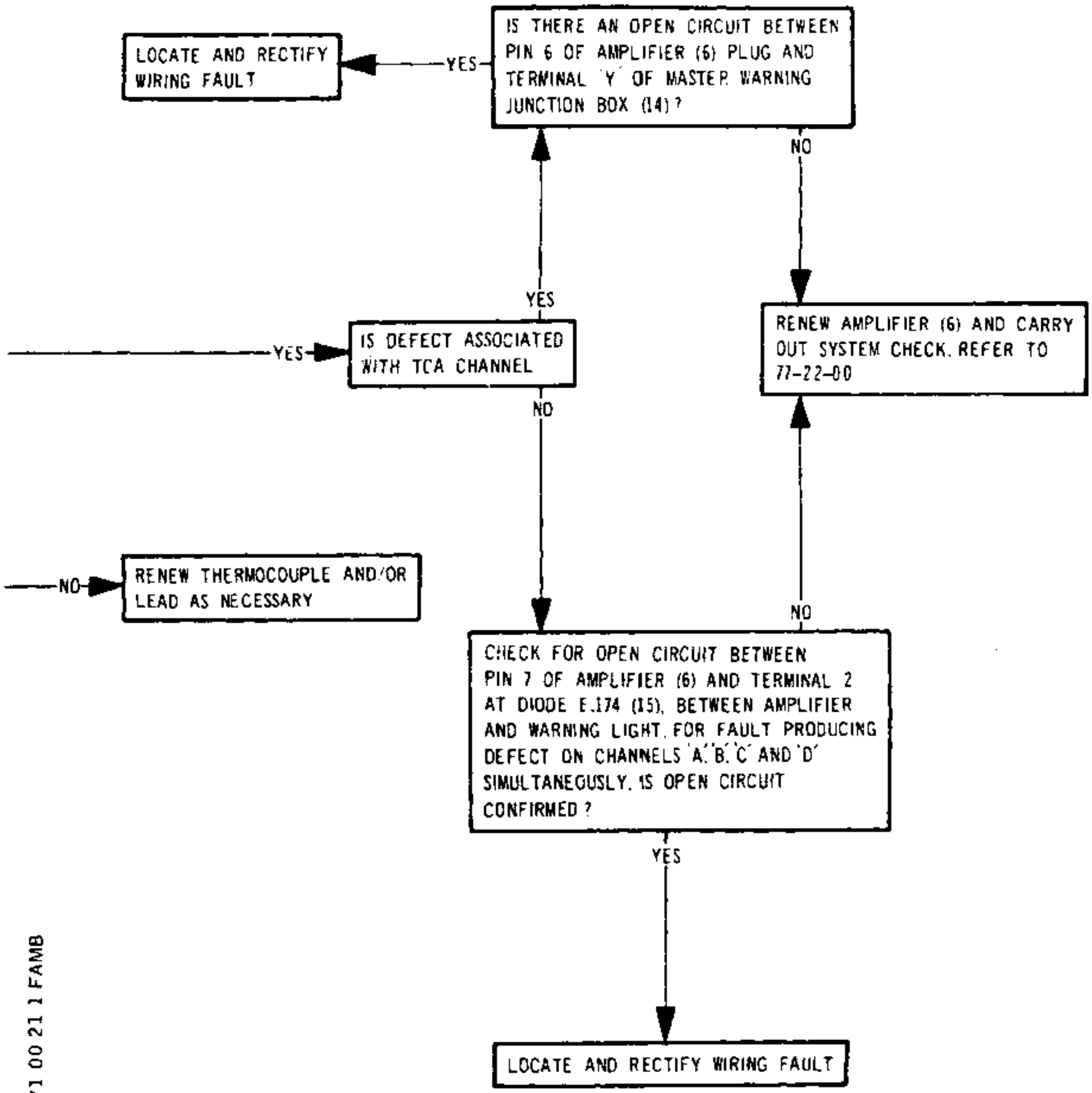
GROUND EQUIPMENT
REFER TO CHART NO. 107



CMR 71 00 21 1 FAMB

Chart 106 (Sheet 2 of 2)

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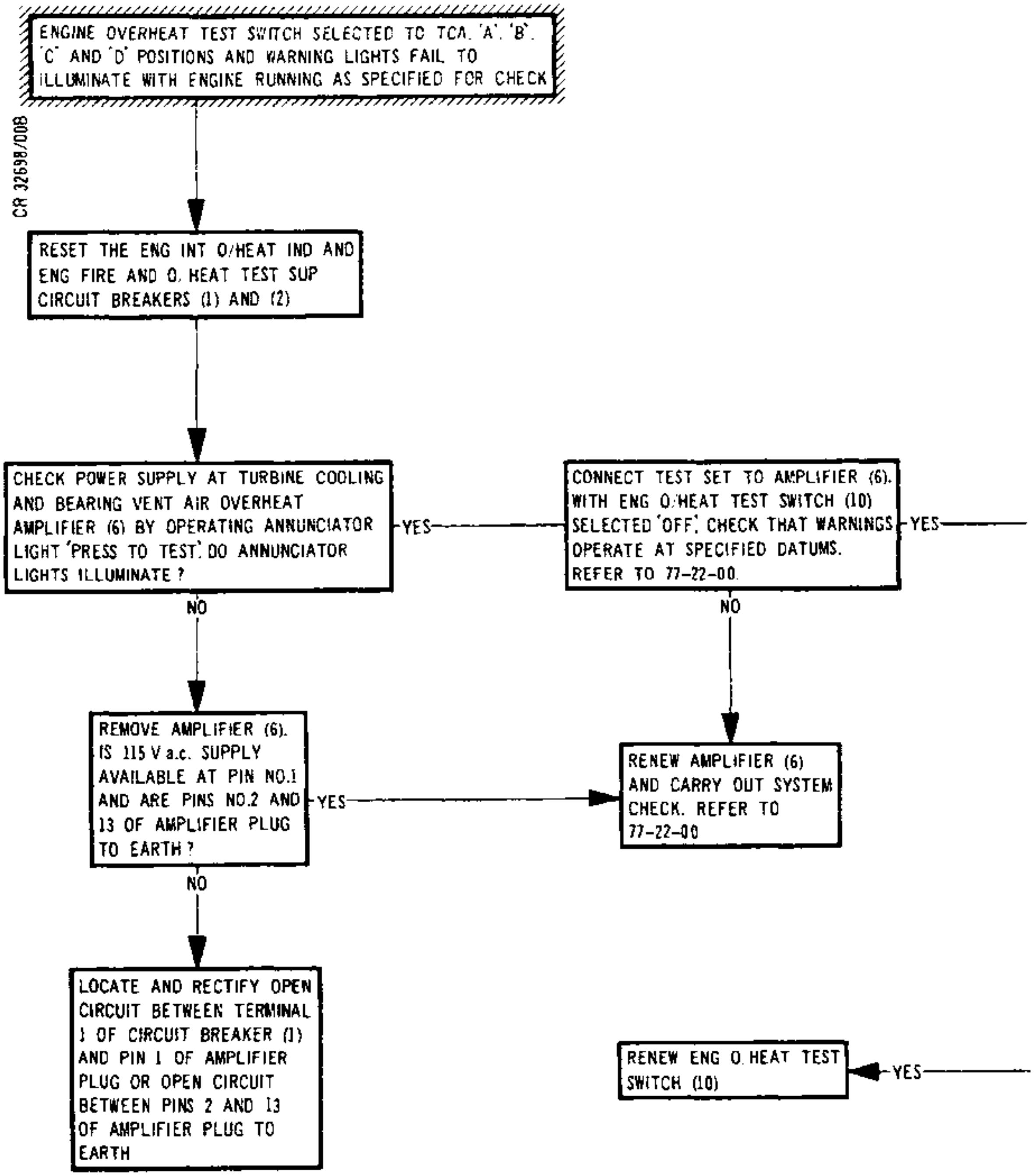

CR 32698/008

CMR 71 00 21 1 GAMA

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Chart 107 (Sheet 1 of 2)

GROUND EQUIPMENT

DESCRIPTION

GROUND POWER SUPPLY (115V a.c. 400 Hz)
GROUND POWER SUPPLY (28V d.c.)
TEST SET AND CABLES PE.19650
D.C. GALVANOMETER POTENTIOMETER OR DIGITAL VOLTMETER 0 TO 50 mV ACCURACY ± 0.01 mV
MULTI-TEST METER OR RESISTANCE METER 0 TO 1000 ohms
D.C. VOLTMETER 0 TO 5V
CIRCUIT BREAKER SAFETY CLIPS

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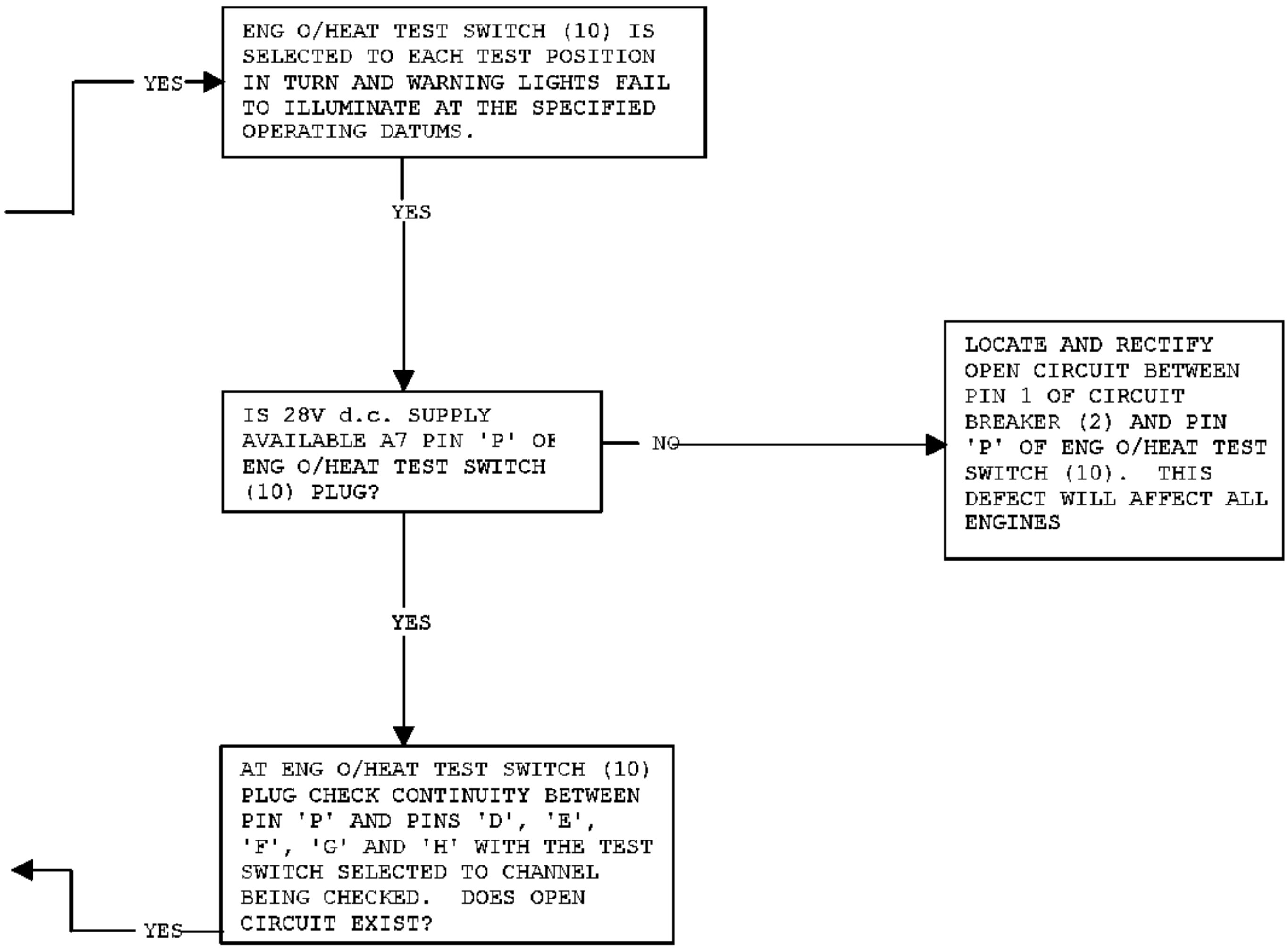

Chart 107 (Sheet 2 of 2)

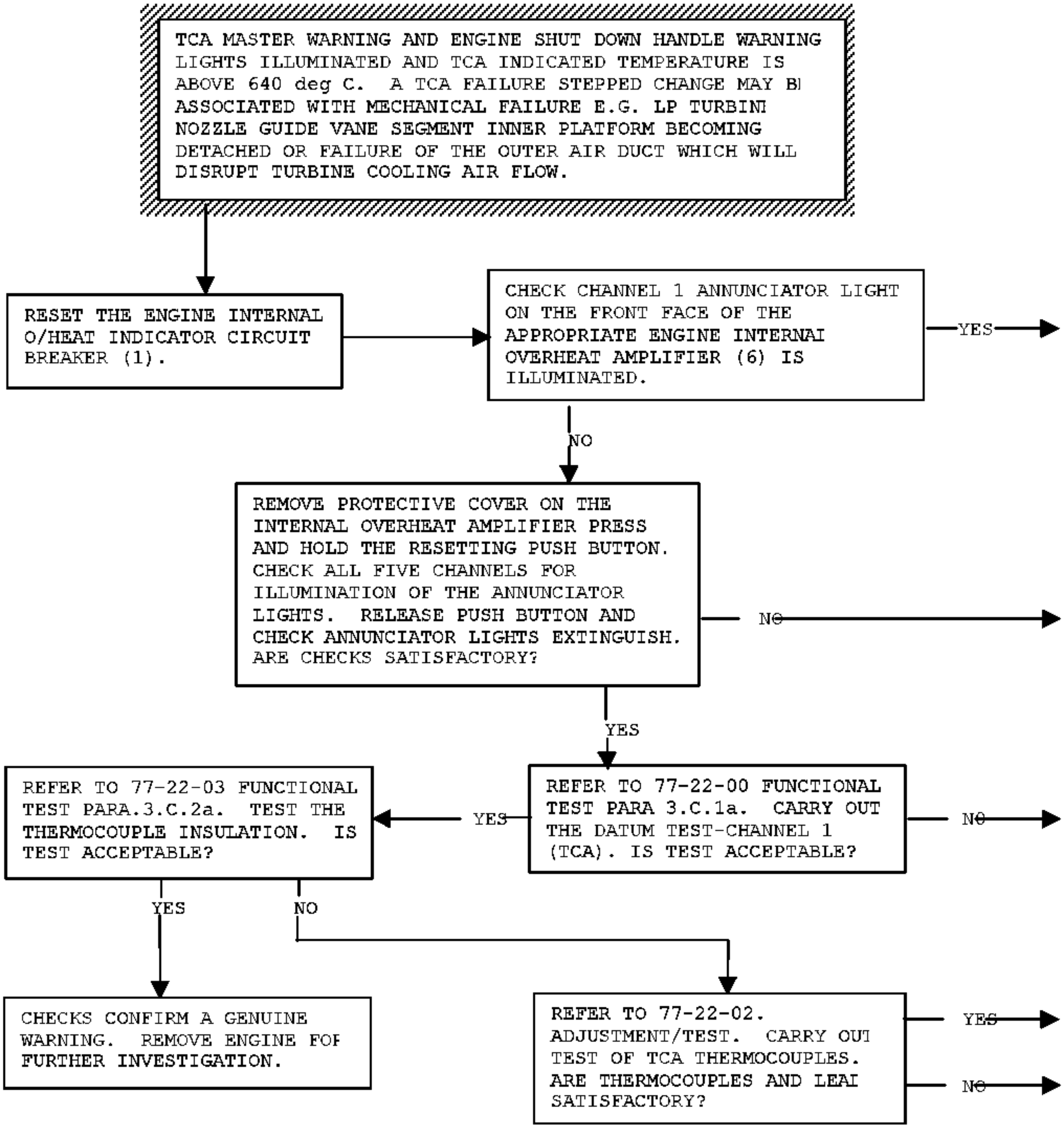

Chart 108 (Sheet 1 of 2)

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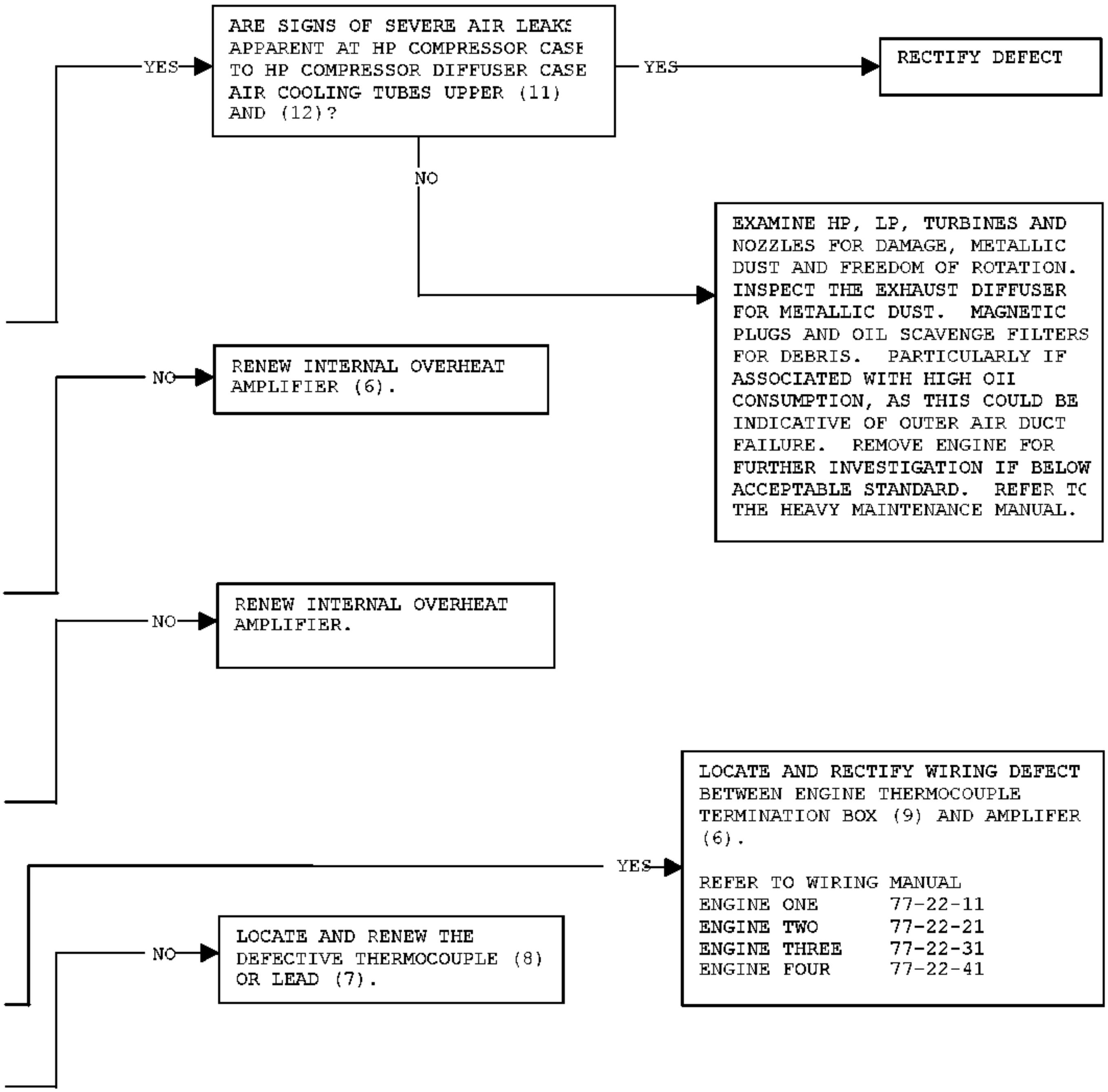

Chart 108 (Sheet 2 of 2)

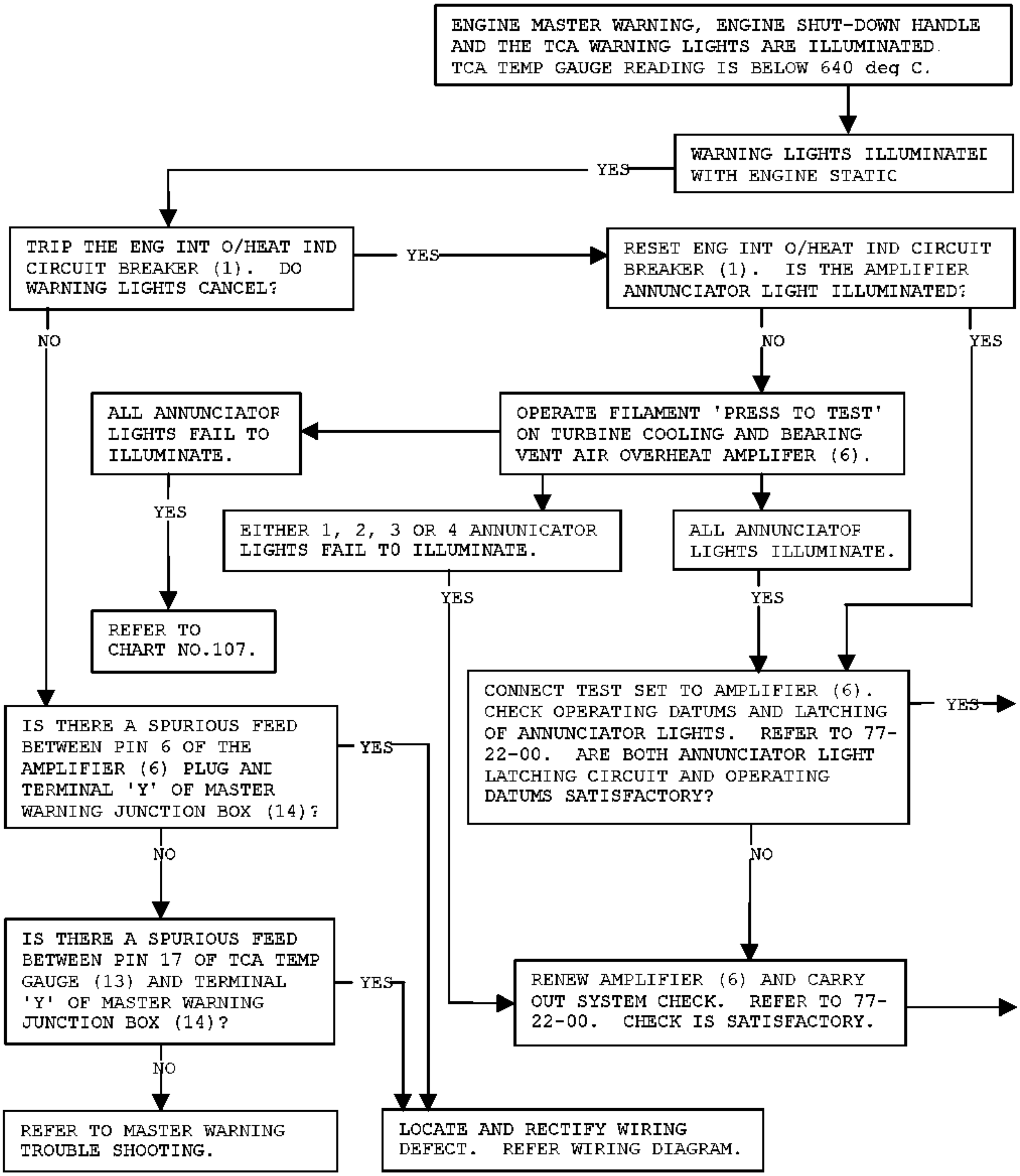

Chart 109 (Sheet 1 of 2)

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GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (115 V a.c. 400 Hz)
GROUND POWER SUPPLY (28 V d.c.)
TEST SET AND CABLES PE.19650
D.C. GALVANOMETER POTENTIOMETER
OR DIGITAL VOLTMETER 0 TO 50 mV
(ACCURACY ± 0·01 mV)
MULTI-TEST OR RESISTANCE
METER 0 TO 1000 ohms
D.C. VOLTMETER 0 TO 5 V
CIRCUIT BREAKER SAFETY CLIPS

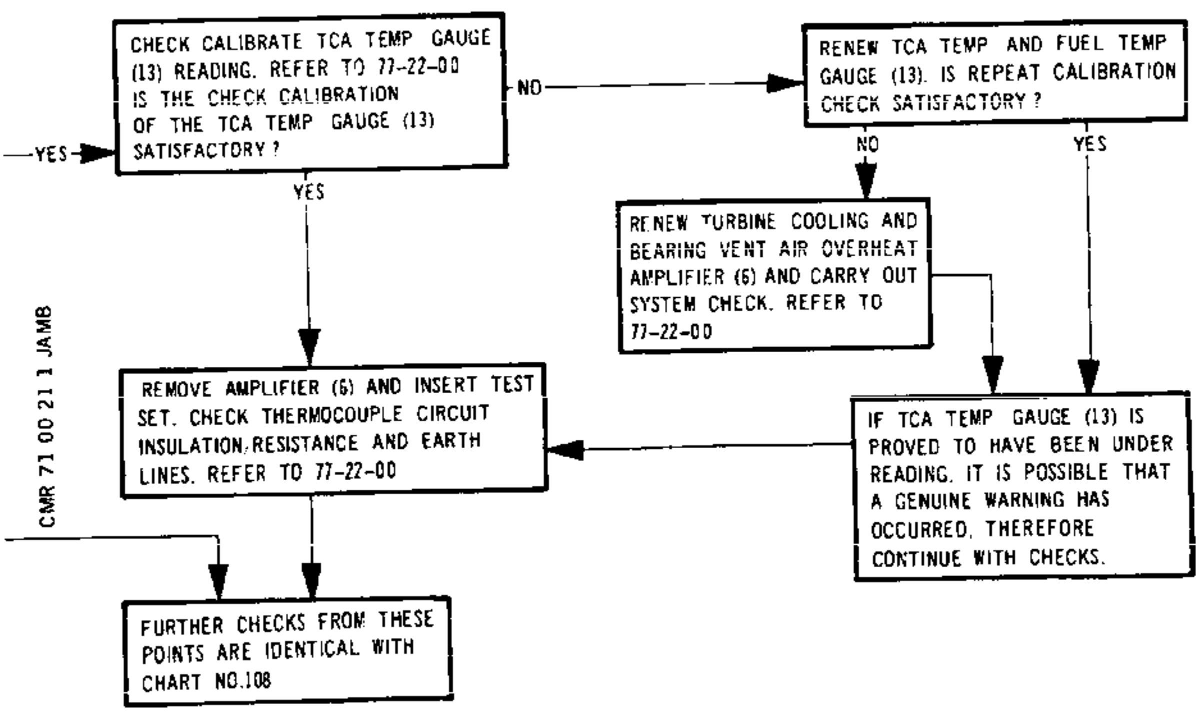
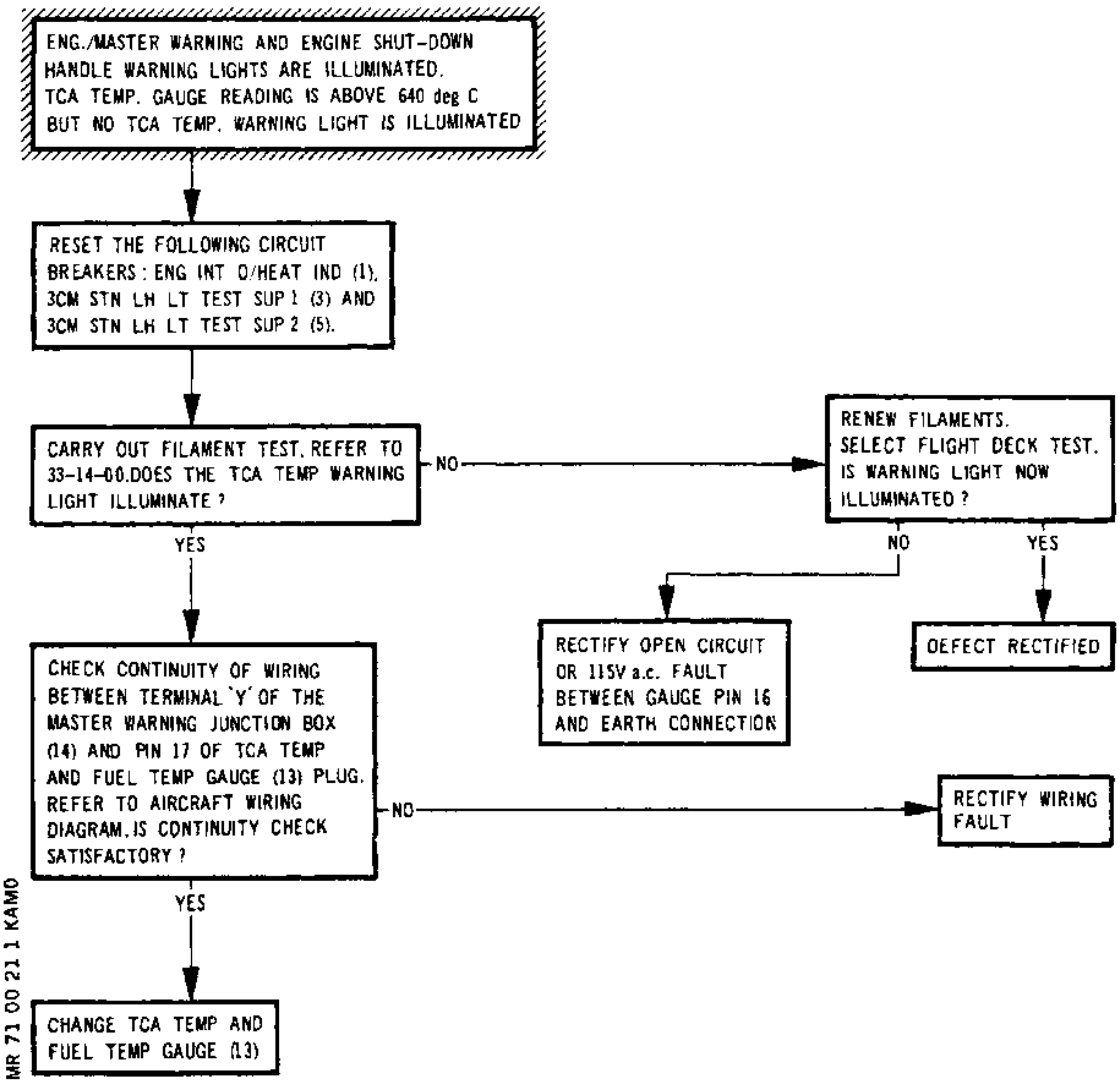


Chart 109 (Sheet 2 of 2)

NOTE : APART FROM FAILURE OF TCA TEMP GAUGE (13), WARNING IS GENUINE AND CHART NO. 108 SHOULD BE REFERRED TO.

GROUND EQUIPMENT DESCRIPTION
GROUND POWER SUPPLY (115V a.c. 400 HZ)
GROUND POWER SUPPLY (28V d.c.)
MULTI-TEST METER

CR 32704/00B



CMR 71 00 21 1 KAMO

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Chart 110

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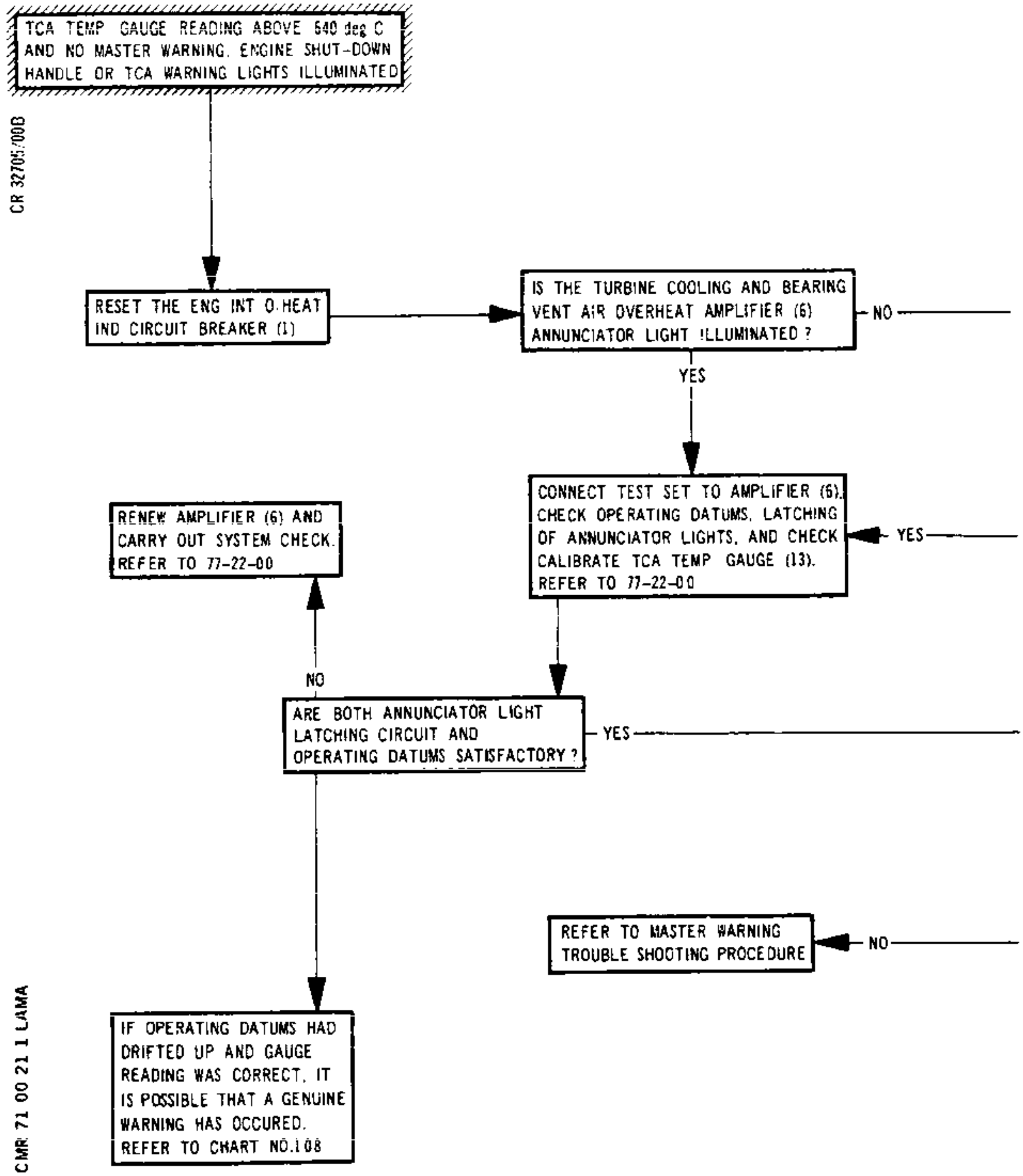
CR 32705/00B



CMR 71 00 21 1 LAMA

R Chart 111 (Sheet 1 of 2)

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (115 V a.c. 400 Hz)
GROUND POWER SUPPLY (28 V d.c.)
TEST SET AND CABLES PE.19650
D.C. GALVANOMETER POTENTIOMETER
OR DIGITAL VOLTMETER 0 TO 50 mV
(ACCURACY ± 0·01 mV)
MULTI-TEST METER OR
RESISTANCE METER 0 TO 1000 ohms
D.C. VOLTMETER 0 TO 5V
CIRCUIT BREAKER SAFETY CLIPS

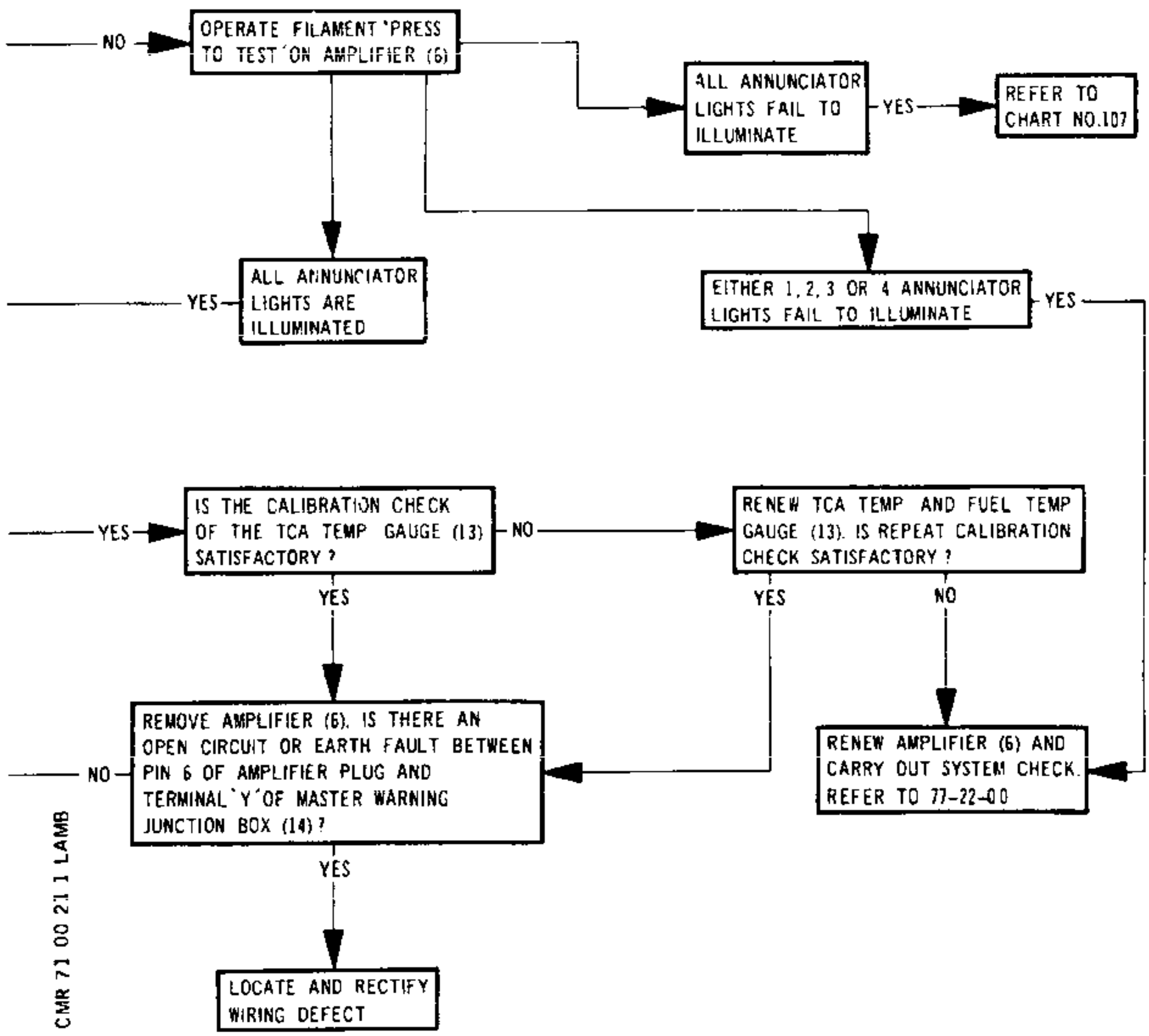


Chart 111 (Sheet 2 of 2)

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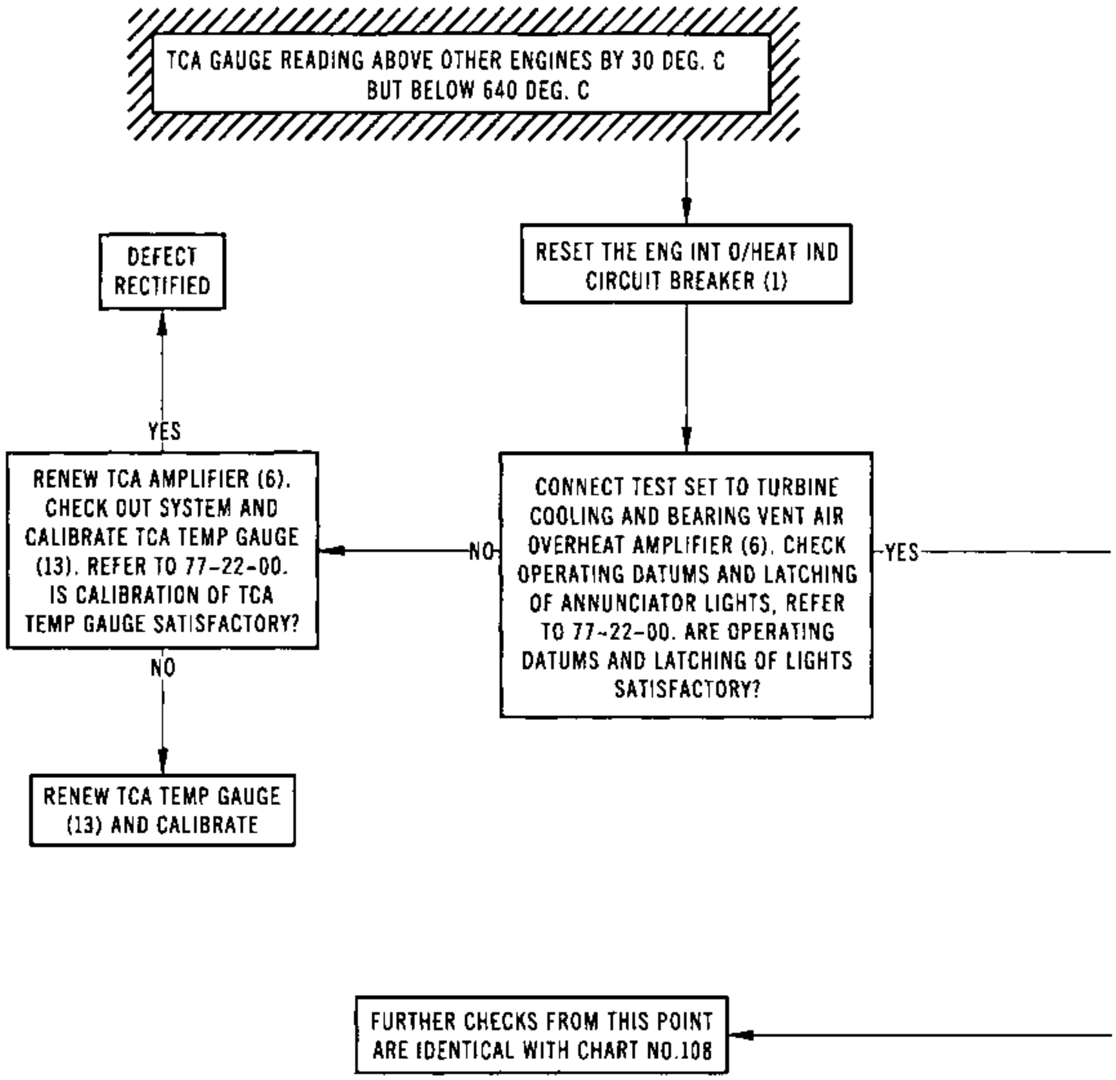
BS00021870/2



IF, FOLLOWING ALL TROUBLESHOOTING, NO DEFECT IS FOUND, THE FOLLOWING SHOULD BE REVIEWED.

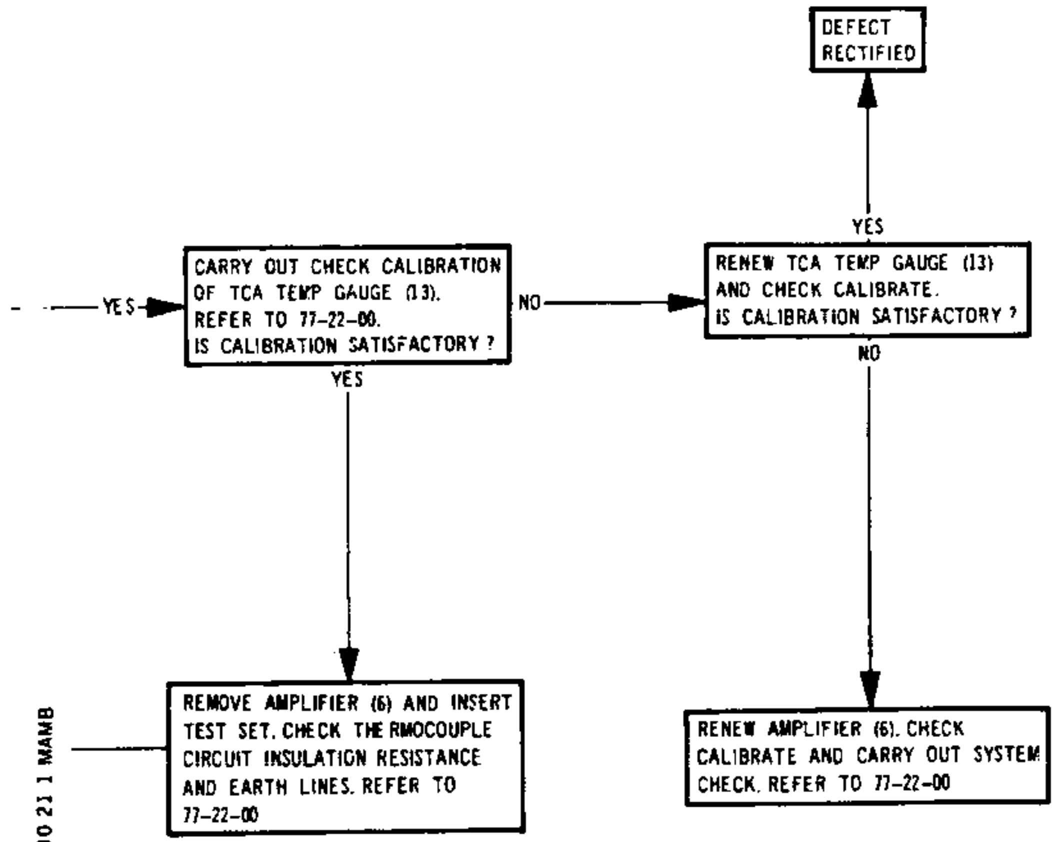
- TCA TEMPERATURE TREND DATA FROM PREVIOUS FLIGHTS.
- HISTORY OF ENGINE CHANGES.
- TCA TEMPERATURES RECORDED DURING PASS-OFF TEST FOR ENGINES INSTALLED AND DISPLACED.

IF THE 30 DEG. C+ TEMPERATURE DIFFERENCE CAN BE EXPLAINED BY A COINCIDENT ENGINE CHANGE, e.g. IF AN ENGINE WITH A LOWER TCA TEMPERATURE IS FITTED REDUCING THE AVERAGE OF THE "OTHER ENGINES", AND THERE IS NO EVIDENCE OF AN INCREASING TREND ON THE SUSPECT ENGINE, THEN THE ENGINE MAY BE CLEARED SUBJECT TO FURTHER TREND ANALYSIS.

IF THE DIFFERENCE CANNOT BE EXPLAINED OR THERE IS A CLEAR UPWARD TCA TEMPERATURE TREND THE ENGINE SHOULD BE REJECTED FOR FURTHER INVESTIGATION.

Chart 112 (Sheet 1 of 2)

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (28V d.c.
AND 115V a.c.)
TEST SET ... PE 19650
MULTI-TEST METER
D.C. VOLTMETER 0 TO 5 V
D.C. GALVANOMETER POTENTIOMETER
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 21 1 MAMB

Chart 112 (Sheet 2 of 2)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
ENGINE NO.1						
(1) Circuit breaker 115 V	-	4-213	1E171	Map ref.E18		
(2) Circuit breaker 28 V	-	15-215	W431	Map ref.B1		
(3) Circuit breaker 28 V	-	15-216	L1003	Map ref.C12		
(4) Circuit breaker 115 V	-	4-213	1E52	Map ref.E20		
(5) Circuit breaker 28 V	-	15-216	L1004	Map ref.C13		
(6) Turbine cooling and bearing vent air overheat amplifier	-	2-215	1E173		77-22-11	
(7) TCA thermo-couple leads	-	415-416	-	-	77-22-03	
(8) TCA thermo-couples	-	415-416	-	-	77-22-02	
(9) Engine thermocouple termination junction box	-	416	-	-	77-22-08	
(10) Eng. O/heat test switch	-	27-214	E172	-	77-00-00	
(11) Air cooling tubes (upper), HP compressor case to HP com-pressor diffuser case	-	416	-	-	75-01-03	
(12) Air cooling	-	416	-	-	75-01-04	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
tubes (lower), HP compressor case to HP compressor diffuser case						
(13) TCA temp. and fuel temp. gauge	-	4-214	1E53	-	77-20-00	
(14) Master warning junction box	-	7-216	US216	-	77-00-00	
(15) Diode E174	-	1-214	1E174	-	77-00-00	
<u>ENGINE NO.2</u>						
(1) Circuit breaker 115 V	-	4-213	2E171	Map ref.B18		
(2) Circuit breaker 28 V	-	15-215	W431	Map ref.B1		
(3) Circuit breaker 28 V	-	15-216	L1003	Map ref.C12		
(4) Circuit breaker 115 V	-	4-213	2E52	Map ref.B20		
(5) Circuit breaker 28 V	-	15-216	L1004	Map ref.C13		
(6) Turbine cooling and bearing vent air overheat amplifier	-	2-215	2E173	-	77-22-11	
(7) TCA thermocouple leads	-	425-426	-	-	77-22-03	
(8) TCA thermocouples	-	425-426	-	-	77-22-02	

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ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(9) Engine thermocouple termination junction box	-	426	-	-	77-22-08	
(10) Eng. O/heat test switch	-	27-214	E172	-	77-00-00	
(11) Air cooling tubes (upper), HP compressor case to HP compressor diffuser case	-	426	-	-	75-01-03	
(12) Air cooling tubes (lower), HP compressor case to HP compressor diffuser case	-	426	-	-	75-01-04	
(13) TCA temp. and fuel temp. gauge	-	4-214	2E53	-	77-20-00	
(14) Master warning junction box	-	7-216	US216	-	77-00-00	
(15) Diode E174	-	1-214	2E174	-	77-00-00	
ENGINE NO.3						
(1) Circuit breaker 115 V	-	4-213	3E171	Map ref.B19		
(2) Circuit breaker 28 V	-	15-215	W431	Map ref.B1		
(3) Circuit breaker 28 V	-	15-216	L1003	Map ref.C12		
(4) Circuit breaker 115 V	-	4-213	3E52	Map ref.B21		

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(5) Circuit breaker 28 V	-	15-216	L1004	Map ref.C13		
(6) Turbine cooling and bearing vent air overheat amplifier	-	2-215	3E173	-	77-22-11	
(7) TCA thermo-couple leads	-	435-436	-	-	77-22-03	
(8) TCA thermo-couples	-	435-436	-	-	77-22-02	
(9) Engine thermocouple termination junction box	-	436	-	-	77-22-08	
(10) Eng. O/heat test switch	-	27-214	E172	-	77-00-00	
(11) Air cooling tubes (upper), HP compressor case to HP com-pressor diffuser case	-	436	-	-	75-01-03	
(12) Air cooling tubes (lower), HP compressor case to HP com-pressor diffuser case	-	436	-	-	75-01-04	
(13) TCA temp. and fuel temp. gauge	-	4-214	3E53	-	77-20-00	
(14) Master warning junction box	-	7-216	US216	-	77-00-00	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(15) Diode E174	-	1-214	3E174	-	77-00-00	
ENGINE NO.4						
(1) Circuit breaker 115 V	-	4-213	4E171	Map ref.E18		
(2) Circuit breaker 28 V	-	15-215	W431	Map ref.B1		
(3) Circuit breaker 28 V	-	15-216	L1003	Map ref.C12		
(4) Circuit breaker 115 V	-	4-213	4E52	Map ref.E21		
(5) Circuit breaker 28 V	-	15-216	L1004	Map ref.C13		
(6) Turbine cooling and bearing vent air overheat amplifier	-	2-215	4E173	-	77-22-11	
(7) TCA thermo-couple leads	-	445-446	-	-	77-22-03	
(8) TCA thermo-couples	-	445-446	-	-	77-22-02	
(9) Engine thermocouple termination junction box	-	446	-	-	77-22-08	
(10) Eng. O/heat test switch	-	27-214	E172	-	77-00-00	
(11) Air cooling tubes (upper), HP compressor case to HP com-pressor diffuser case	-	446	-	-	75-01-03	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(12) Air cooling tubes (lower), HP compressor case to HP compressor diffuser case	-	446	-	-	75-01-04	
(13) TCA temp. and fuel temp. gauge	-	4-214	4E53	-	77-20-00	
(14) Master warning junction box	-	7-216	US216	-	77-00-00	
(15) Diode E174	-	1-214	4E174	-	77-00-00	

Component Identification
Table 101

ENGINE ANTI-ICING - TROUBLE SHOOTING

1. General

A. The engine anti-icing control and indication system consists of a selector switch, air valve, pressure switch and a caption light. The electrical circuit is so arranged that the circuit breaker for a nominated engine provides 28 V d.c. for valve control of that engine and also 28 V d.c. for the indication circuit of its adjacent engine.

B. The caption light is activated by the pressure switch the contacts of which close when the system air pressure is above 9 plus or minus 2 psi (S.B.OL.593-75-13) 14 plus or minus 2 psi (pre-S.B.OL.593-75-13). When the anti-icing selector switch is selected ON the controlling air valve solenoid is energized which causes the air valve to open and pass an air flow into the anti-icing system.

C. Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is detailed in Table 101.

D. Operation of the engine anti-icing air system under certain
R conditions of flight could cause carbon deposits in the LP compressor front bearing chamber and its oil scavenge tubes.

2. Preparation

A. Ensure that the electrical power supply is connected and switched on and carry out a check of indication lamp filament operation.

B. Consult chart 101 and carry out the actions indicated to determine which of the Trouble Shooting Charts is applicable. The procedures given relate to S.B.OL.593-75-12 standard engines only.

3. Restore to Flight Standard

A. Complete and check any necessary rectification.

B. Reconnect all points where disconnection has been made during checking and rectification procedures.

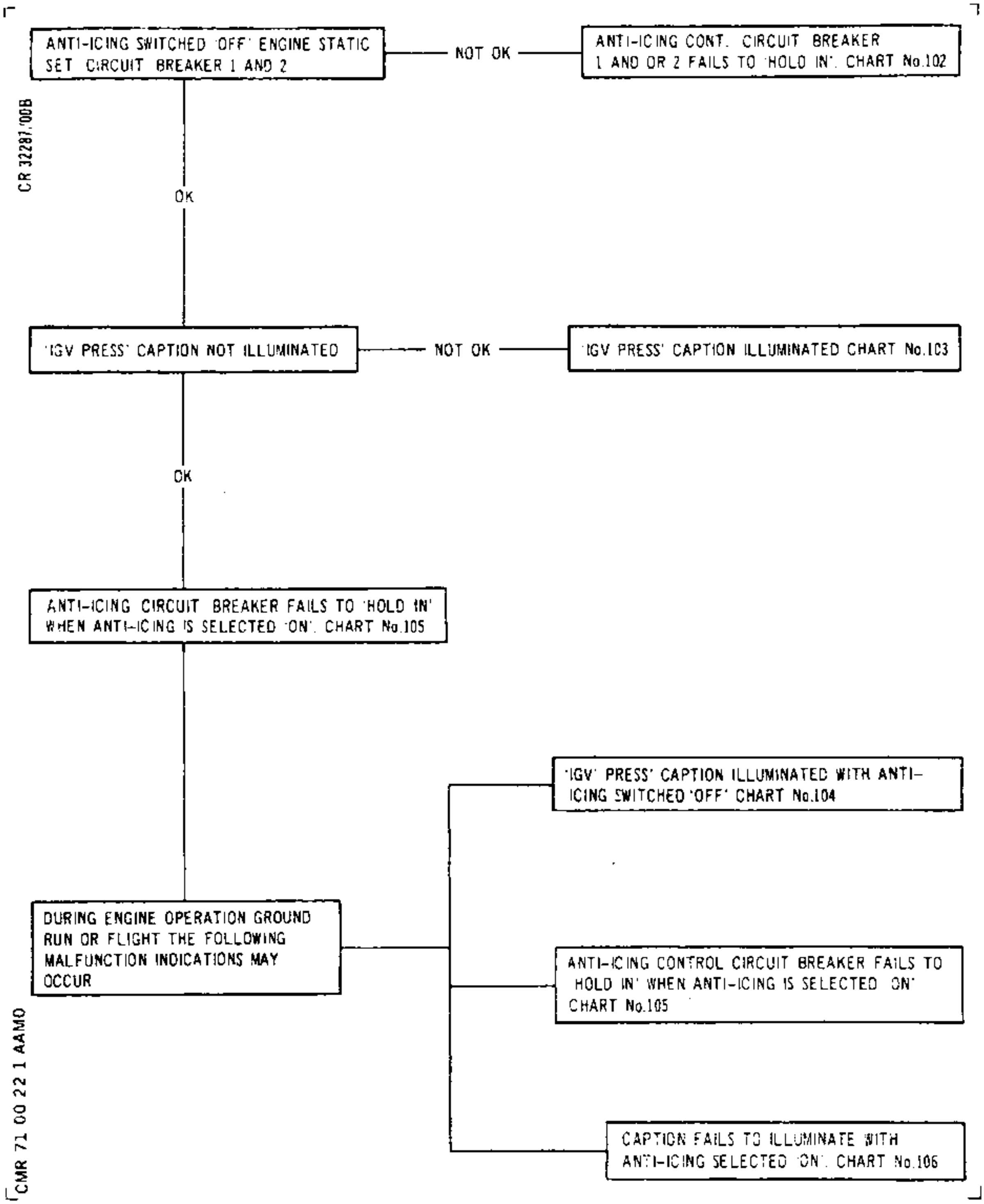

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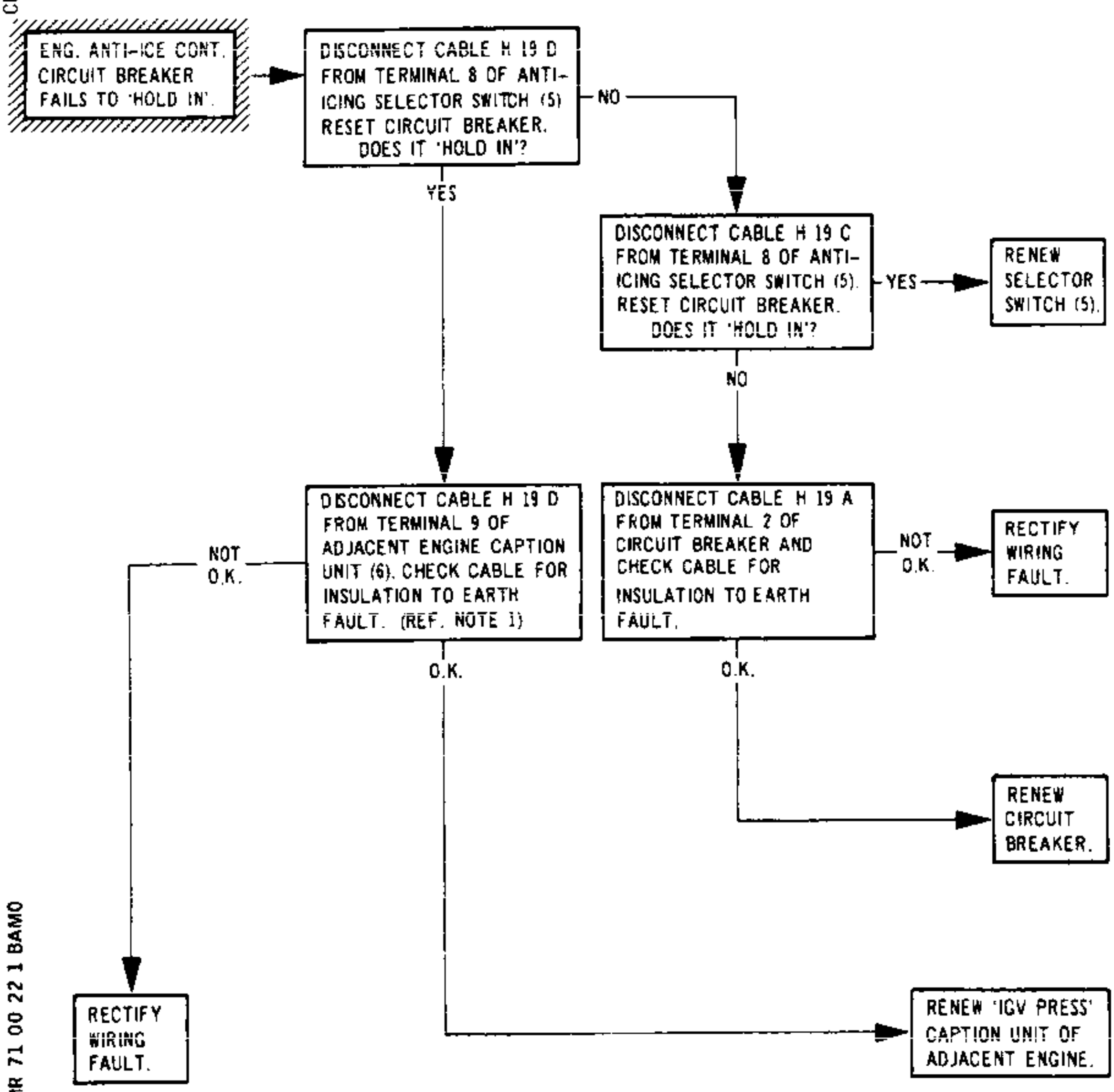
Chart 101
Figure 101

NOTE: CIRCUIT BREAKER SUPPLIES CONTROL VOLTAGE TO ITS NOMINATED ENGINE AND INDICATION VOLTAGE TO ADJACENT ENGINE I.E. No.1 CIRCUIT BREAKER SUPPLIES VOLTAGE TO No.1 ANTI-ICING VALVE SOLENOID AND No.2 ENGINE CAPTION LIGHT.

GROUND EQUIPMENT DESCRIPTION
GROUND POWER SUPPLY (28V d.c.)
MULTI-TEST METER.
CIRCUIT BREAKER SAFETY CLIPS.

CR 32289/00B



CMR 71 00 22 1 BAMO

Chart 102
Figure 102

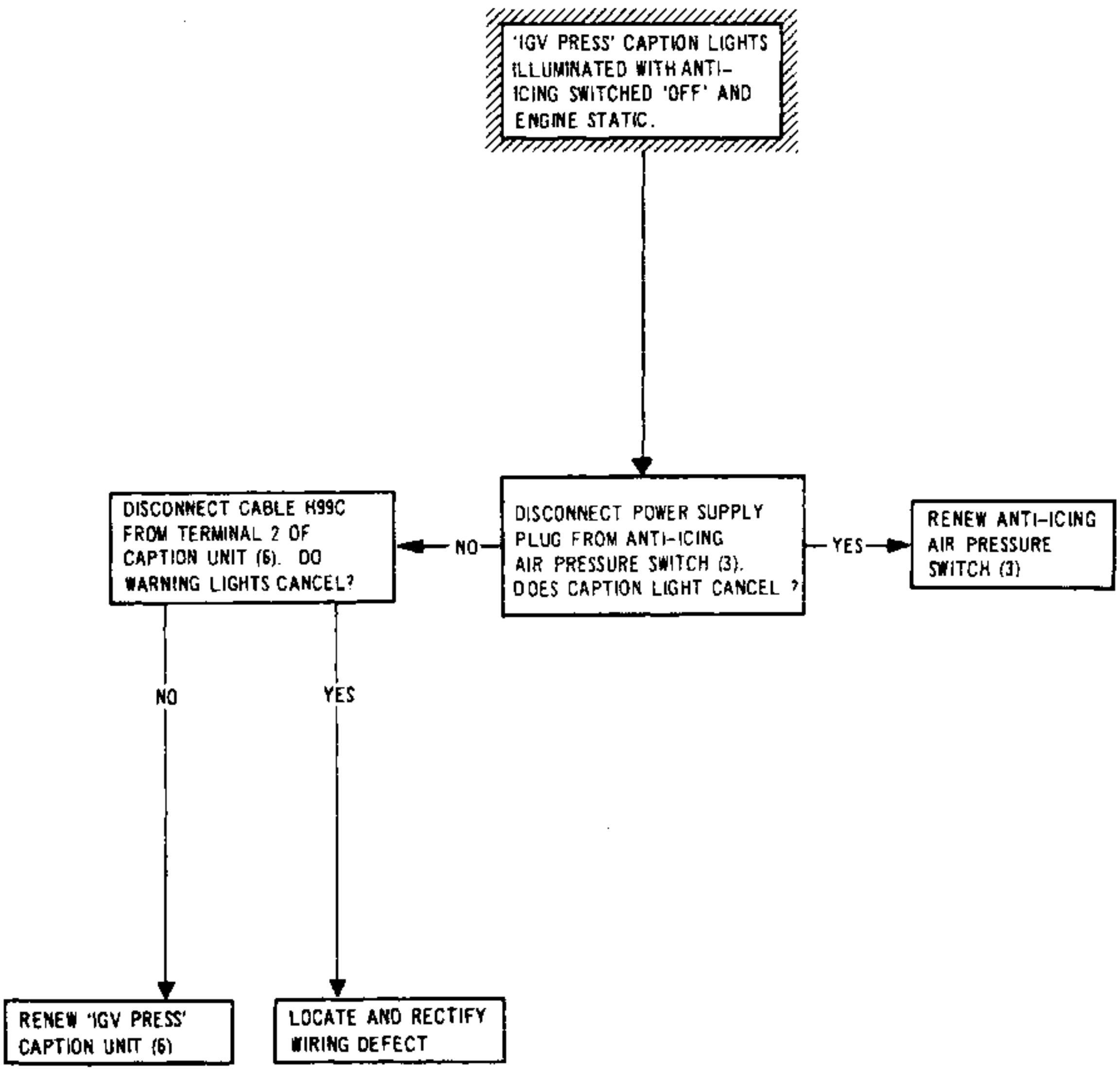
R

NOTE: CIRCUIT BREAKER SUPPLIES CONTROL VOLTAGE TO ITS NOMINATED ENGINE AND INDICATION VOLTAGE TO ADJACENT ENGINE. I.E. No.1 CIRCUIT BREAKER SUPPLIES VOLTAGE TO No.1 AIR VALVE SOLENOID AND No.2 ENGINE CAPTION LIGHT.

GROUND EQUIPMENT DESCRIPTION

GROUND POWER SUPPLY (28V d.c.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS

CR 32291/00B



CMR 71 00 22 1 CAMO

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Chart 103
Figure 103

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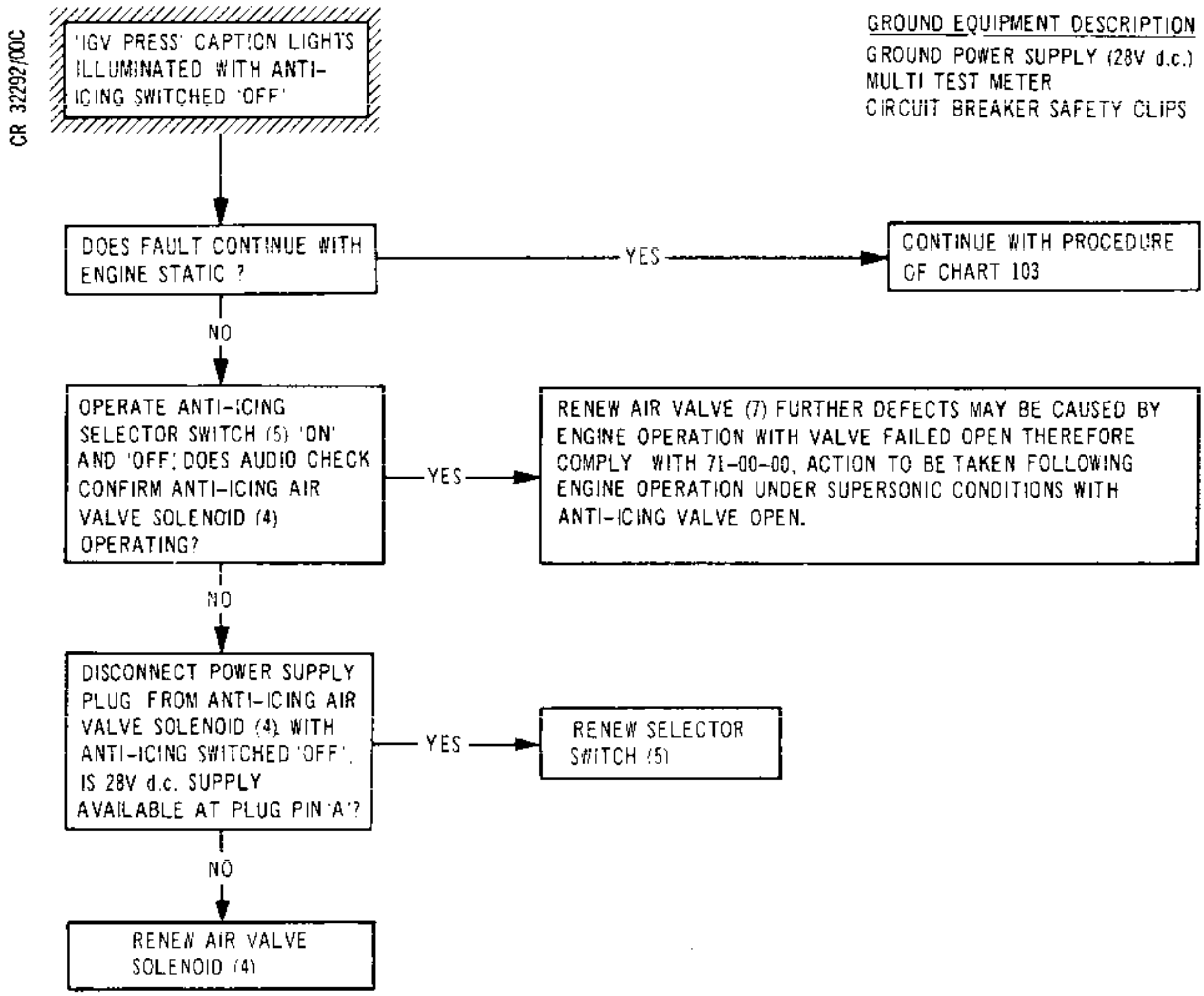

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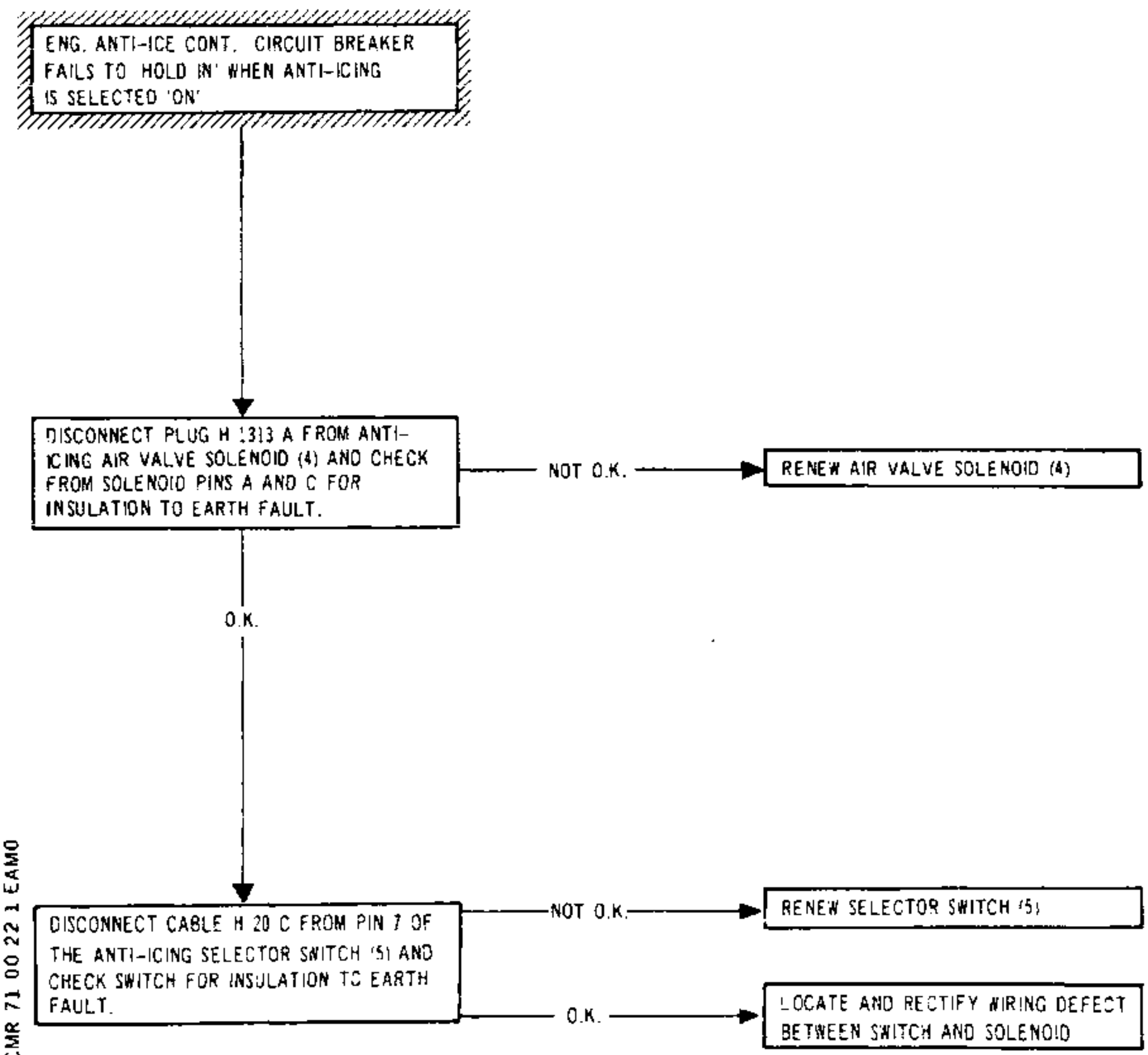
Chart 104
Figure 104

NOTE: CIRCUIT BREAKER SUPPLIES CONTROL VOLTAGE TO ITS NOMINATED ENGINE AND INDICATION VOLTAGE TO ADJACENT ENGINE. I.E. No.1 CIRCUIT BREAKER SUPPLIES VOLTAGE TO No.1 AIR VALVE SOLENOID AND No.2 ENGINE CAPTION LIGHT.

GROUND EQUIPMENT DESCRIPTION
GROUND POWER SUPPLY (28V d.c.)
MULTI-TEST METER. PRESSURE TEST EQUIPMENT (0–25 psi).
CIRCUIT BREAKER SAFETY CLIPS.

CR 32294 008



CMR 71 00 22 1 EAM0

Chart 105
Figure 105

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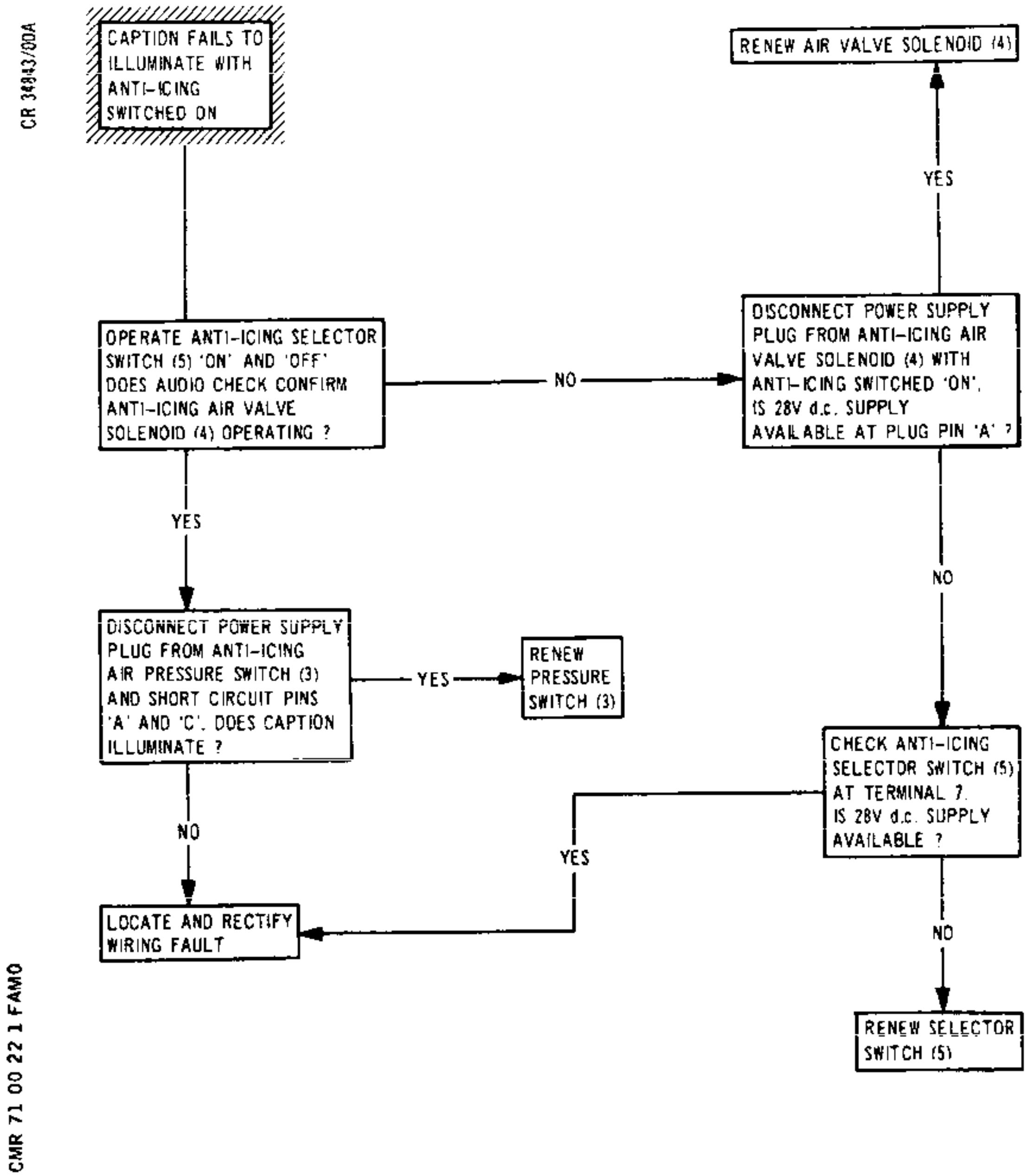

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Chart 106
Figure 106

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1					
(1) ENG.1 ANTI-ICE CONT circuit breaker	15-216	1H1311	C10		
(2) ENG.2 ANTI-ICE CONT circuit breaker	15-215	2H1311	B15		
(3) Engine anti-icing air pressure switch	416	-	-	75-41-01	75-12-11 75-41-11
(4) Engine anti-icing air valve solenoid	416	-	-	75-12-01	
(5) Engine anti-icing selector switch	4-211	1H1312	-	75-00-00	
(6) IGV PRESS caption unit	4-211	1H1302	-	75-00-00	
(7) Engine anti-icing air valve	416	-	-	75-12-01	
(8) Anti-icing air tubes	416	-	-	75-11-02	
ENGINE NO.2					
(1) ENG.2 ANTI-ICE CONT circuit breaker	15-215	2H1311	B15		
(2) ENG.1 ANTI-ICE CONT circuit breaker	15-216	1H1311	C10		
(3) Engine anti-icing air pressure switch	426	-	-	75-41-01	75-12-11 75-41-11

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(4) Engine anti-icing air valve solenoid	426	-	-	75-12-01	
(5) Engine anti-icing selector switch	4-211	2H1312	-	75-00-00	
(6) IGV PRESS caption unit	4-211	2H1302	-	75-00-00	
(7) Engine anti-icing air valve	426	-	-	75-12-01	
(8) Anti-icing air tubes	426	-	-	75-11-02	
<u>ENGINE NO.3</u>					
(1) ENG.3 ANTI-ICE CONT circuit breaker	15-215	3H1311	B16		
(2) ENG.4 ANTI-ICE CONT circuit breaker	15-216	4H1311	C11		
(3) Engine anti-icing air pressure switch	436	-	-	75-41-01	75-12-11 75-41-11
(4) Engine anti-icing air valve solenoid	436	-	-	75-12-01	
(5) Engine anti-icing selector switch	4-211	3H1312	-	75-00-00	
(6) IGV PRESS caption unit	4-211	3H1302	-	75-00-00	
(7) Engine anti-icing air valve	436	-	-	75-12-01	

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(8) Anti-icing air tubes	436	-	-	75-11-02	
ENGINE NO.4					
(1) ENG.4 ANTI-ICE CONT circuit breaker	15-216	4H1311	C11	)	
(2) ENG.3 ANTI-ICE CONT circuit breaker	15-215	3H1311	B16	)	
(3) Engine anti-icing air pressure switch	446	-	-	75-41-01)	)75-12-11)75-41-11
(4) Engine anti-icing air valve solenoid	446	-	-	75-12-01)	
(5) Engine anti-icing selector switch	4-211	4H1312	-	75-00-00)	
(6) IGV PRESS caption unit	4-211	4H1302	-	75-00-00)	
(7) Engine anti-icing air valve	446	-	-	75-12-01	
(8) Anti-icing air tubes	446	-	-	75-11-02	

END OF THIS SECTION

NEXT

ENGINE DRAINS - TROUBLE SHOOTING

1. General

   A. Fuel and oil drainage from engine mounted components is directed to three overboard drain outlets at the bottom of the engine.

   B. Oil drainage from the main and standby hydraulic pumps, integrated drive generator to gearbox seal cavity, air starter and LP compressor front bearing is carried by external tubes to four connections on the oil tank vent tube manifold elbow to which a seal plate is attached forming an overboard drain outlet with the engine bay door.

   C. Seal failure fuel drainage from the main fuel feed and recirculation tube joints, recirculation valve, fuel inlet and first stage fuel pump, fuel filter and feed tube, second stage fuel pump and flow control unit, reheat flowmeter and fuel filter, electric starter pump, fuel cooled oil cooler and distribution and dump valve is discharged overboard at the drains tank outlet seal plate. Dump fuel (on normal engine shut-down) and gland drains from the first and second stage fuel pumps and the flow control unit is fed into the drains tank. Overflow from the drains tank in the event of a defect permitting excessive fuel to drain into the tank is also discharged overboard at the outlet seal plate as is oil drainage from the integrated drive generator rupture valve. A 'press to test' facility is provided to check for gland leakage.

   D. The exhaust diffuser drain assembly permits drainage of fuel from the turbine and jet pipe following an abortive start or wet motoring cycle.

   E. The engine oil system provides lubrication for the air starter and its splined drive, the IDG input shaft bearing and splined drive and the splined drives of the first stage fuel pump and fuel flow control unit. Failure of the shaft seals will result in an increased engine oil consumption rate.

   F. Identification of components indicated by numbers in parenthesis in the charts is detailed in Table 101.

R G. Refer to Table 102 for details of permitted and likely
R fuel leakages obtainable with the engine static. In
R addition the quantity of fuel dumped during normal shut
R downs and false starts is included.

R NOTE: No leakage is permitted from the FCU/SSP
R static seal drain system.

2. Preparation

WARNING: COMPLY WITH ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

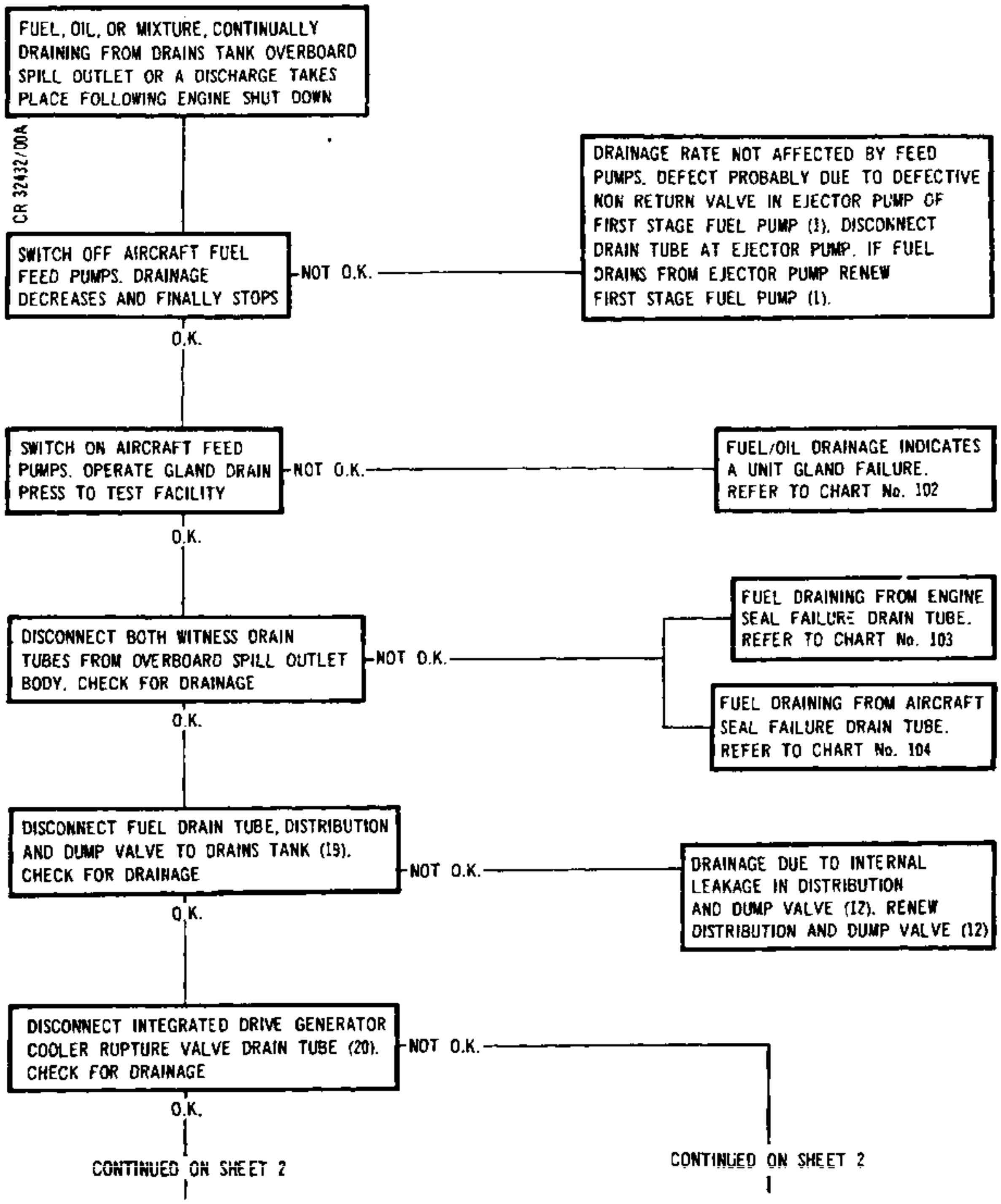
A. Ensure that external electrical power supply is connected and switched on.

B. Consult chart 101 and carry out actions indicated to determine which of the trouble shooting charts is applicable.

3. Restore to Flight Standard

A. Complete and check any necessary rectification.

B. Reconnect all points where disconnection has been made during checking and rectification procedures.



CR 32432/00A

CMR 71 00 24 1 AAMA

Chart 101 (Sheet 1 of 2)

CR 32433/00B

CONTINUED FROM SHEET 1

O.K.

JET PUMP SYSTEM DEFECTIVE. CHECK THAT ALL TUBE CONNECTIONS BETWEEN DRAINS TANK AND JET PUMP ARE TIGHT. IF THEY ARE SATISFACTORY RENEW FIRST STAGE FUEL PUMP (1)

CONTINUED FROM SHEET 1

NOT O.K.

DRAINAGE INDICATES THAT THE INTEGRATED DRIVE GENERATOR RUPTURE VALVE (21) HAS OPERATED, MOST PROBABLY DUE TO FUEL ENTERING DRIVE OIL SYSTEM VIA THE OIL COOLER (9). RENEW OIL COOLER (9) AND WHERE CONSIDERED NECESSARY ALSO THE INTEGRATED DRIVE GENERATOR (16).

NOTE: THIS DEFECT WOULD BE ACCOMPANIED BY A RISE IN THE OIL TEMPERATURE OF THE INTEGRATED DRIVE GENERATOR DURING FLIGHT

SHOULD THE INTEGRATED DRIVE GENERATOR OIL TEMPERATURES BE SATISFACTORY THE DRAINAGE MAY BE DUE TO A DEFECTIVE RUPTURE VALVE. CARRY OUT A DRAEGER CHECK ON AN OIL SAMPLE DRAINED FROM THE DRIVE. REFER TO 24-11-11. IF CHECK IS SATISFACTORY RENEW RUPTURE VALVE (21)

CMR 71 00 24 1 AAMB

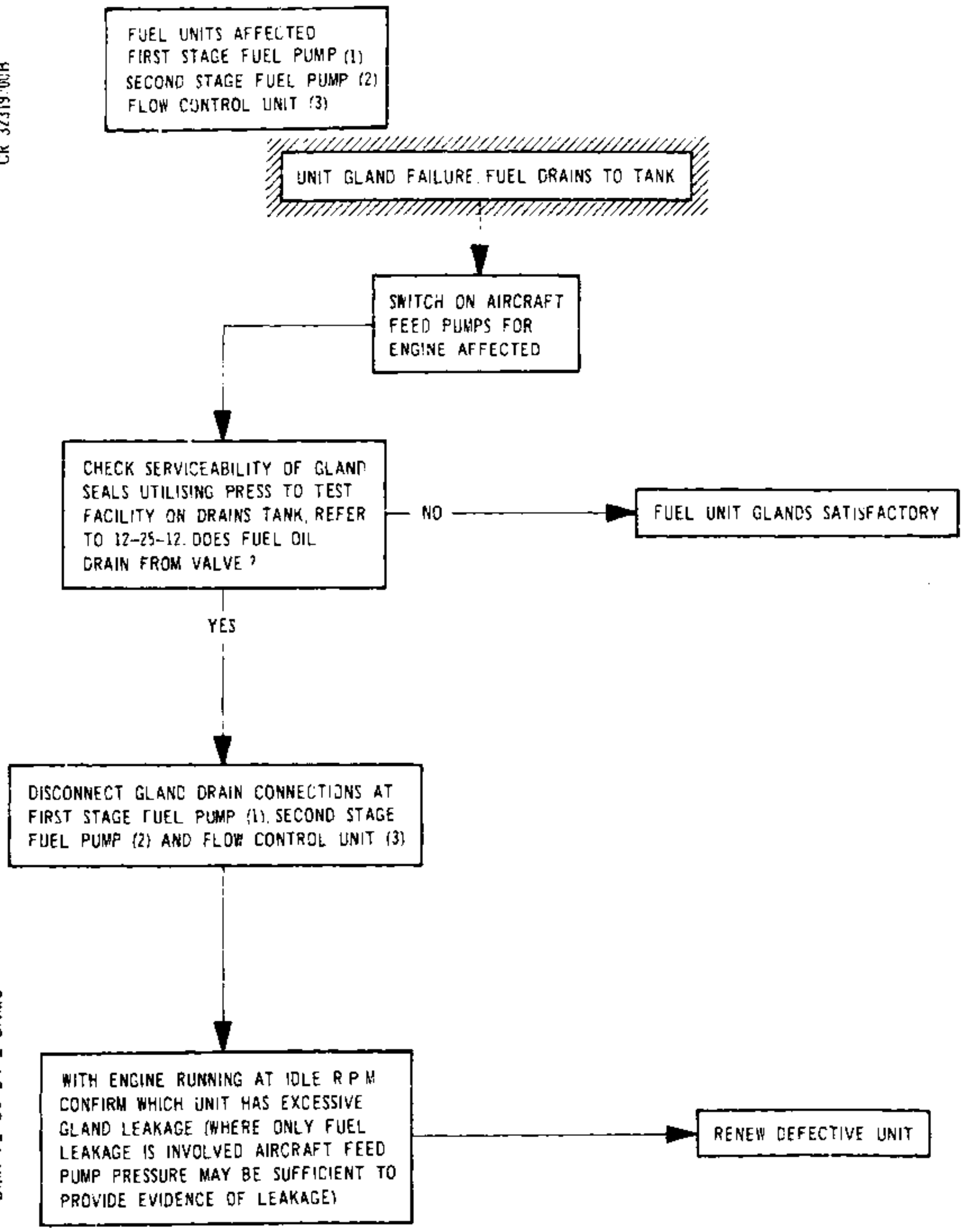
OIL DISCHARGE FROM OIL TANK VENT AND OVERBOARD DRAINS SEAL PLATE

IT IS NECESSARY TO RUN ENGINE TO CONFIRM SOURCE OF LEAKAGE. REFER TO CHART No.105

R

Chart 101 (Sheet 2 of 2)

CR 32319 00R



CMR 71 00 24 1 BAMO

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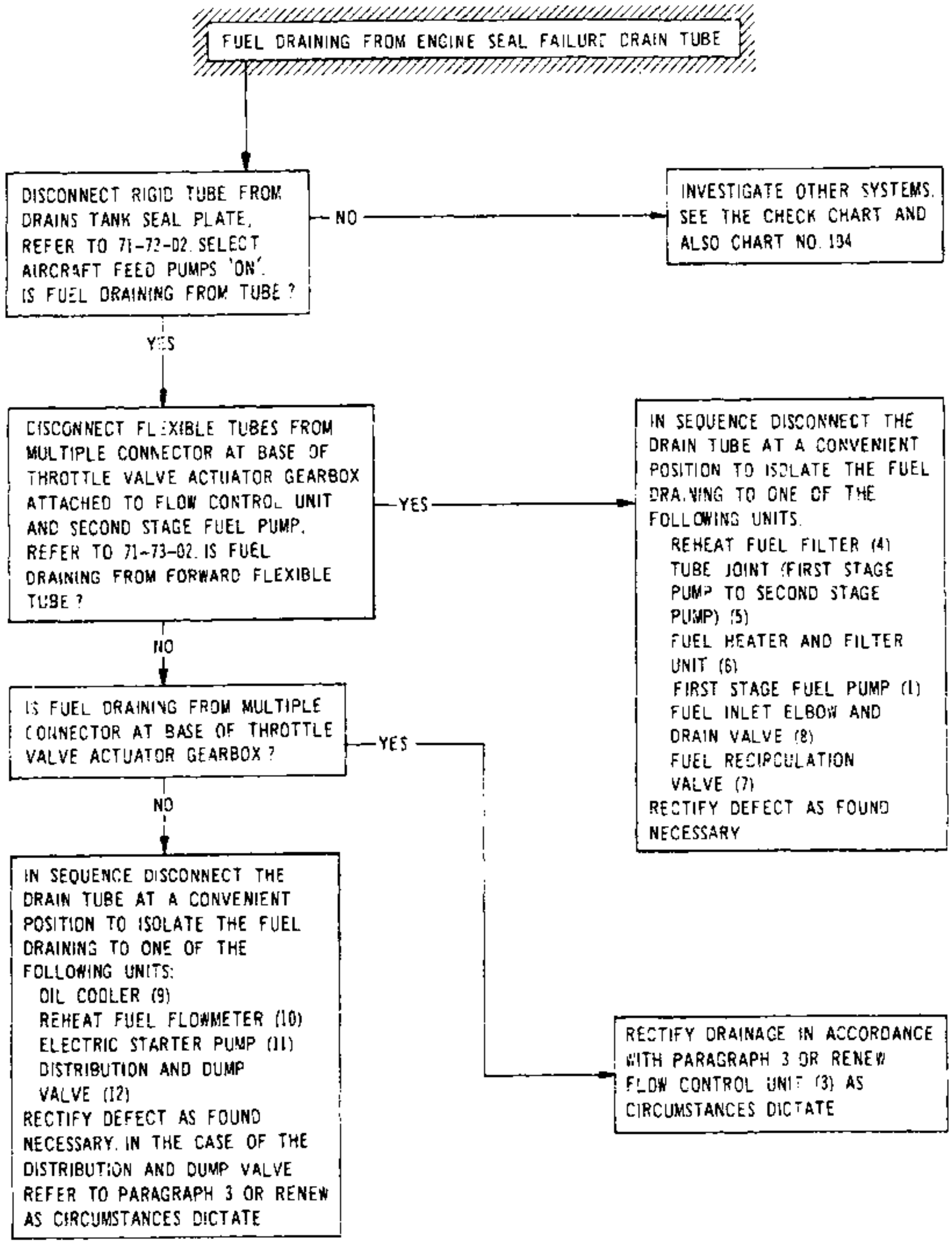
Chart 102

CR 32320/00B



CMR 71 00 24 1 CAMO

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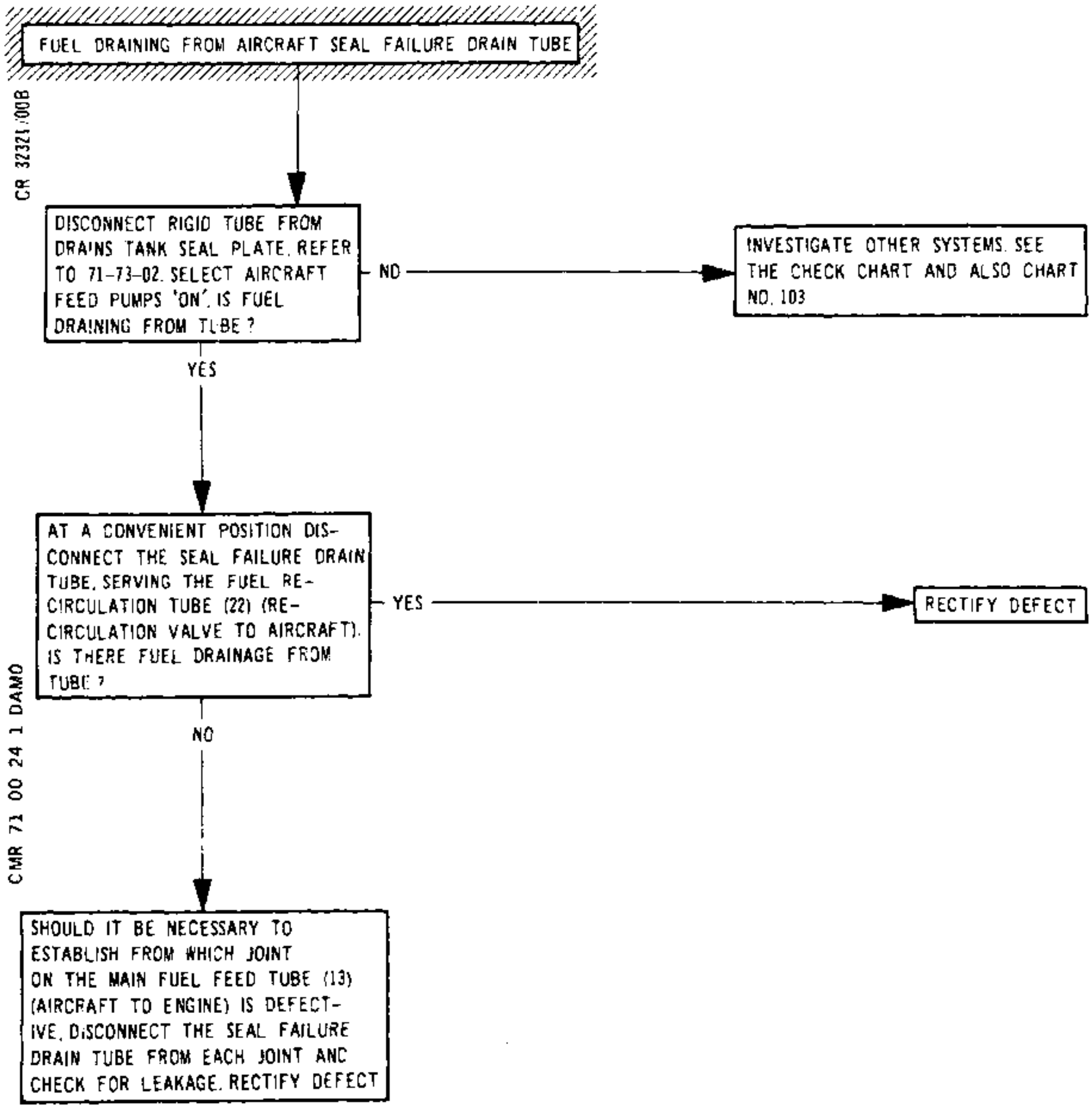
Chart 103


FUEL DRAINING FROM AIRCRAFT SEAL FAILURE DRAIN TUBE
CR 32321/00B
DISCONNECT RIGID TUBE FROM DRAINS TANK SEAL PLATE. REFER TO 71-73-02. SELECT AIRCRAFT FEED PUMPS 'ON'. IS FUEL DRAINING FROM TUBE ?
NO
INVESTIGATE OTHER SYSTEMS. SEE THE CHECK CHART AND ALSO CHART NO. 103
YES
AT A CONVENIENT POSITION DISCONNECT THE SEAL FAILURE DRAIN TUBE, SERVING THE FUEL RECIRCULATION TUBE (22) (RECIRCULATION VALVE TO AIRCRAFT). IS THERE FUEL DRAINAGE FROM TUBE ?
YES
RECTIFY DEFECT
NO
CMR 71 00 24 1 DAMO
SHOULD IT BE NECESSARY TO ESTABLISH FROM WHICH JOINT ON THE MAIN FUEL FEED TUBE (13) (AIRCRAFT TO ENGINE) IS DEFECTIVE, DISCONNECT THE SEAL FAILURE DRAIN TUBE FROM EACH JOINT AND CHECK FOR LEAKAGE. RECTIFY DEFECT

R

Chart 104

CR 32322/00A
BS00000230/5

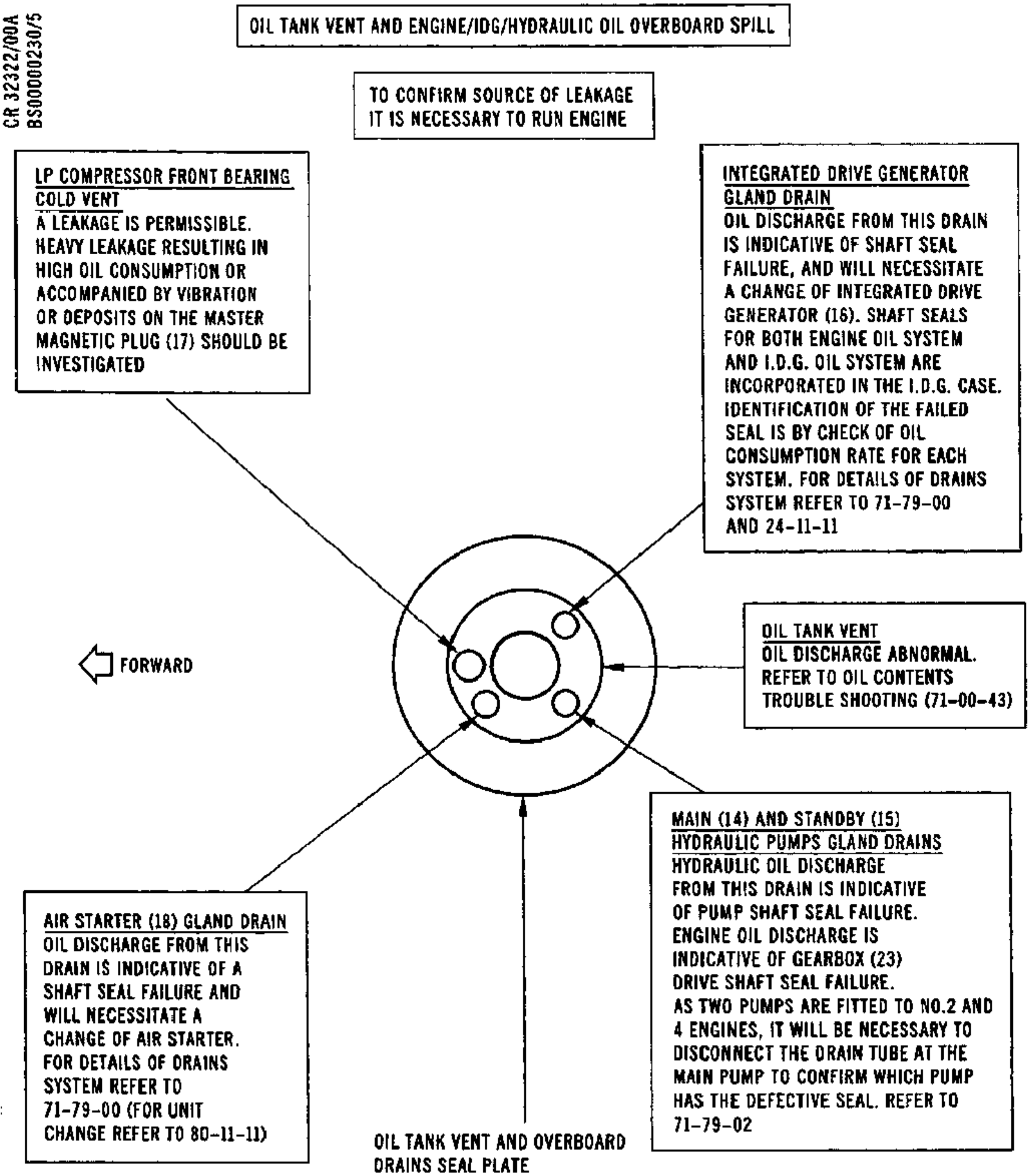


Chart 105

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1						
(1) First stage fuel pump	-	415	-	-	73-11-01	
(2) Second stage fuel pump	-	415	-	-	73-11-02	
(3) Flow control unit	-	415	-	-	73-21-01	
(4) Reheat fuel filter	-	415/416	-	-	73-13-03	
(5) Fuel tube (first stage pump to second stage pump)	-	415	-	-	73-13-01	
(6) Fuel heater and filter	-	415	-	-	73-14-01	
(7) Fuel recirc-ulation valve	-	415	-	-	73-12-01	
(8) Fuel inlet elbow and drain valve	-	415	-	-	73-12-03	
(9) Oil cooler	-	415	-	-	79-21-01	
(10)Reheat fuel flowmeter	-	415	-	-	73-33-02	
(11)Electric starter pump	-	415	-	-	73-11-03	
(12)Distribution and dump valve	-	415	-	-	73-12-02	
(13)Main fuel feed tube (air-craft to engine)	-	415	-	-	28-00-00	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(14)Main hydraulic pump	-	416	-	-	29-11-00	
(15)Standby hydraulic pump	-	416	-	-	29-12-00	
(16)Integrated drive generator	-	416	-	-	24-11-11	
(17)Engine master magnetic plug	DB	415	-	-	79-23-01	
(18)Air starter	-	416	-	-	80-11-11	
(19)Fuel drain tube, distribution and dump valve to drains tank	-	415	-	-	71-73-05	
(20)Integrated drive generator cooler rupture valve drain tube	-	415/416	-	-	71-79-00	
(21)Integrated drive generator rupture valve	-	416	-	-	24-11-11	
(22)Fuel recirculation tube (recirculation valve to aircraft)	-	415	-	-	28-00-00	
(23)Right-hand gearbox	-	416	-	-	72-63-00	
<u>ENGINE NO.2</u>						
(1) First stage fuel pump	-	425	-	-	73-11-01	
(2) Second stage fuel pump	-	425	-	-	73-11-02	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(3) Flow control unit	-	425	-	-	73-21-01	
(4) Reheat fuel filter	-	425/426	-	-	73-13-03	
(5) Fuel tube (first stage pump to second stage pump)	-	425	-	-	73-13-01	
(6) Fuel heater and filter	-	425	-	-	73-14-01	
(7) Fuel recirc-ulation valve	-	425	-	-	73-12-01	
(8) Fuel inlet elbow and drain valve	-	425	-	-	73-12-03	
(9) Oil cooler	-	425	-	-	79-21-01	
(10)Reheat fuel flowmeter	-	425	-	-	73-33-02	
(11)Electric starter pump	-	425	-	-	73-11-03	
(12)Distribution and dump valve	-	425	-	-	73-12-02	
(13)Main fuel feed tube (air-craft to engine)	-	425	-	-	28-00-00	
(14)Main hydraulic pump	-	426	-	-	29-11-00	
(15)Standby hydraulic pump	-	426	-	-	29-12-00	
(16)Integrated drive generator	-	426	-	-	24-11-11	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(17)Engine master magnetic plug	DB	425	-	-	79-23-01	
(18)Air starter	-	426	-	-	80-11-11	
(19)Fuel drain tube, distri-bution and dump valve to drains tank	-	425	-	-	71-73-05	
(20)Integrated drive generator cooler rupture valve drain tube	-	425/426	-	-	71-79-00	
(21)Integrated drive generator rupture valve	-	426	-	-	24-11-11	
(22)Fuel recirc-ulation tube (recirculation valve to aircraft)	-	425	-	-	28-00=00	
(23)Right-hand gearbox	-	426	-	-	72-63-00	
<u>ENGINE NO.3</u>						
(1) First stage fuel pump	-	435	-	-	73-11-01	
(2) Second stage fuel pump	-	435	-	-	73-11-02	
(3) Flow control unit	-	435	-	-	73-21-01	
(4) Reheat fuel filter	-	435/436	-	-	73-13-03	
(5) Fuel tube (first stage	-	435	-	-	73-13-01	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
pump to second stage pump)						
(6) Fuel heater and filter	-	435	-	-	73-14-01	
(7) Fuel recirc- ulation valve	-	435	-	-	73-12-01	
(8) Fuel inlet elbow and drain valve	-	435	-	-	73-12-03	
(9) Oil cooler	-	435	-	-	79-21-01	
(10)Reheat fuel flowmeter	-	435	-	-	73-33-02	
(11)Electric starter pump	-	435	-	-	73-11-03	
(12)Distribution and dump valve	-	435	-	-	73-12-02	
(13)Main fuel feed tube (air- craft to engine)	-	435	-	-	28-00-00	
(14)Main hydraulic pump	-	436	-	-	29-11-00	
(15)Standby hydraulic pump	-	436	-	-	29-12-00	
(16)Integrated drive generator	-	436	-	-	24-11-11	
(17)Engine master magnetic plug	DB	435	-	-	79-23-01	
(18)Air starter	-	436	-	-	80-11-11	
(19)Fuel drain tube, distri- bution and	-	435	-	-	71-73-05	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
dump valve to drains tank						
(20)Integrated drive generator cooler rupture valve drain tube	-	435/436	-	-	71-79-00	
(21)Integrated drive generator rupture valve	-	436	-	-	24-11-11	
(22)Fuel recirc- ulation tube (recirculation valve to aircraft)	-	435	-	-	28-00-00	
(23)Right-hand gearbox	-	436	-	-	72-63-00	
ENGINE NO.4						
(1) First stage fuel pump	-	445	-	-	73-11-01	
(2) Second stage fuel pump	-	445	-	-	73-11-02	
(3) Fuel control unit	-	445	-	-	73-21-01	
(4) Reheat fuel filter	-	445/446	-	-	73-13-03	
(5) Fuel tube (first stage pump to second stage pump)	-	445	-	-	73-13-01	
(6) Fuel heater and filter	-	445	-	-	73-14-01	
(7) Fuel recirc- ulation valve	-	445	-	-	73-12-01	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(8) Fuel inlet elbow and drain valve	-	445	-	-	73-12-03	
(9) Oil cooler	-	445	-	-	79-21-01	
(10)Reheat fuel flowmeter	-	445	-	-	73-33-02	
(11)Electric starter pump	-	445	-	-	73-11-03	
(12)Distribution and dump valve	-	445	-	-	73-12-02	
(13)Main fuel feed tube (air-craft to engine)	-	445	-	-	28-00-00	
(14)Main hydraulic pump	-	446	-	-	29-11-00	
(15)Standby hydraulic pump	-	446	-	-	29-12-00	
(16)Integrated drive generator	-	446	-	-	24-11-11	
(17)Engine master magnetic plug	DB	445	-	-	79-23-01	
(18)Air starter	-	446	-	-	80-11-11	
(19)Fuel drain tube, distri-bution and dump valve to drains tank	-	445	-	-	71-73-05	
(20)Integrated drive generator cooler rupture valve drain tube	-	445/446	-	-	71-79-00	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(21)Integrated drive generator rupture valve	-	446	-	-	24-11-11	
(22)Fuel recirc-ulation tube (recirculation valve to aircraft)	-	445	-	-	28-00-00	
(23)Right-hand gearbox	-	446	-	-	72-63-00	

Component Identification
Table 101

R 4. Locating Defective Seals

A. Fuel Leaking from Actuator Gearbox.

(1) Fuel leakage from the actuator gearbox seal drain is indicative of a defective seal (at a tube connection to the flow control unit (FCU), at the mating face seal between the actuator and FCU or an internal seal failure of these components (Ref. Fig. 101).

(2) Ascertain if the leak is associated with the FCU or the actuator gearbox.

(a) Remove the actuator gearbox (Ref.71-11-01, Removal/Installation).

(b) Check for leakage at the ports X, Y, W and D on the exposed face of the FCU (Ref. Fig. 101).

(b1) The defect is associated with the FCU if there is any leakage from ports X, Y or W or a leakage in excess of 30 cc/min occurs from port D.

NOTE: Port D is a transfer port that is isolated from the drains system when the actuator gearbox

is installed. There would be no discharge from the drains connection of an installed actuator unless a seal was defective.

(b2) If the leakage checks at the FCU are satisfactory, the defect is in the actuator gearbox or its seal plate.

(3) Use the detailed procedure given in 73-21-01, Adjustment/Test to identify the defective seal associated with the FCU.

B. Fuel Leaking from Distribution and Dump Valve Drains Connection.

(1) Fuel leakage from the distribution and dump valve seal drain connection is indicative of a defective seal at tube connections, at the flowmeter connections, at blanking plates or at internal seals (Ref. Fig. 102).

(2) Use the procedure detailed in 73-12-02, Adjustment/Test to identify the defective seal.

DRAIN PORT **X**

F.1. FCU FUEL OUTLET TUBE SEAL
2. BLANKING PLUG SEALS (FRONT FACE OF FCU BODY)

G.1. FCU TO DISTRIBUTION AND DUMP VALVE (SERVO TUBE) SEAL
2. STARTER PUMP TO FCU FUEL TUBE SEAL

H.1. FCU TO DISTRIBUTION AND DUMP VALVE (SERVO SPILL TUBE) SEAL
H.2. SOLENOID BLOCK SEAL

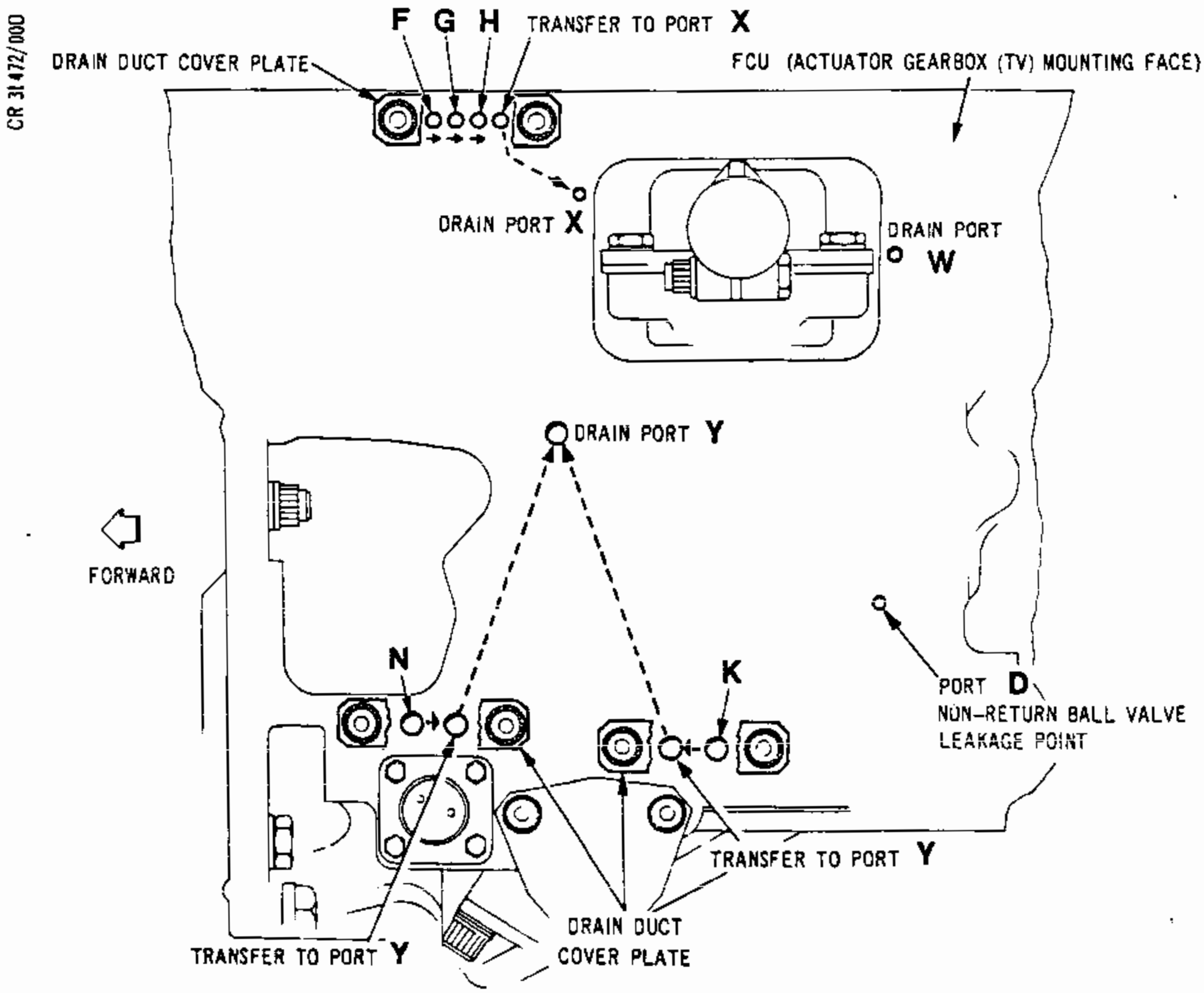
DRAIN PORT **Y**

K.1. SECOND STAGE PUMP TO FCU JOINT SEAL
2. FUEL INLET TUBE TO SECOND STAGE PUMP SEAL
3. PUMP INTERNAL SEALS

N. FCU SPILL TO FIRST STAGE PUMP INLET TUBE SEAL

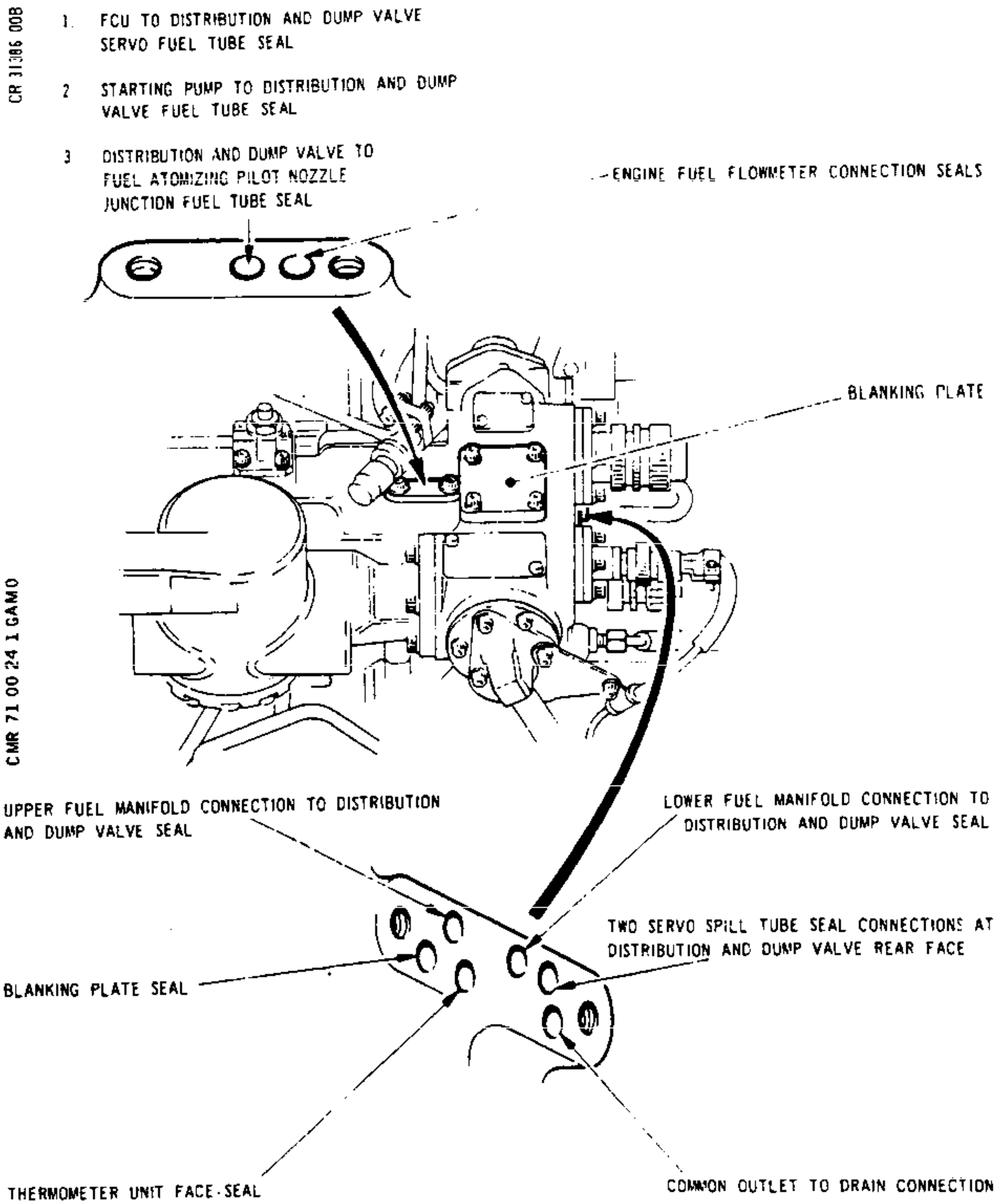
DRAIN PORT **W**

1. SOLENOID BLOCK INTERFACE SEALS
2. SOLENOID VALVE SEALS
3. FCU INTERNAL SEALS



VIEW ON UNDERSIDE OF FCU (ACTUATOR REMOVED)

FCU Seal Failure Drains
Transfer Passages and Outlets
Figure 101



Distribution and Dump Valve
Seal Failure Drains Transfer Passages
Figure 102

R

ACCESSORY	TEST SCHEDULE LIMITS	INSTALLED LIMITS AND TYPICAL LEAKAGES
FCU outlet i.e. SOC etc. (to Drains tank)	5 cc/min. (case 1)* 0.33 cc/min. (case 2)*	As test limits Average of 10 units 1 cc/min. (case 1)* 0.1 cc/min. (case 2)*
FCU drive gland seal drain	5 cc/min.	12 cc/min. (case 1)*
FSP drive gland seal drain	5 cc/min.	12 cc/min. (case 1)*
SSP turbine gland seal drain	10 cc/min. (case 3)*	12 cc/min. (case 1)*

NOTE: Gland leakage typically does not exceed 1 cc/min.

Ignitor jet (to can drain or drains tank)	10 cc/hr (case 1)* 5 cc/hr (case 2)* (ESP Check Valve limits)	None quoted

* Case 1 Engine static. LP Cock open. Aircraft boost pump ON.
Case 2 Engine static. LP Cock open. Aircraft boost pump OFF.
Case 3 Engine running equivalent to 90% NH.

Fuel dumped to drains tank on shutdown approx. 500 cc.

Fuel drainage on false start:-

to drains tank	approx. 400 cc
to turbine drain	approx. 1000 cc
to jet pipe drains	approx. 350 cc

Engine Fuel Leakage
Table 102

FIRE FLAPS (SECONDARY AIR DOORS AND ENGINE BAY VENTILATION FLAP) - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.
OBSERVE THE ENGINE BAY DOOR OPENING AND FIREFLAPS FUNCTIONAL TEST SAFETY PRECAUTIONS IN 71-00-00, SERVICING AND 71-31-00, ADJUSTMENT/TEST.

CAUTION: DO NOT OPERATE THE SECONDARY AIR DOORS MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

R B
R B
R B
R B
R B
NOTE: For any technical log entry that involves failure of the secondary air door system to operate correctly, a **torque and current** draw check must be carried out as per M.M. 71-31-00 pages 502-511 at first aircraft stop at LHR.

1. General

Faults are dealt with on a probability basis and identified as a result of testing. They can also develop on the ground or during flight.

The defect can be isolated, with the aid of trouble shooting procedures (Ref. para 3, 5, 7), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting, unless otherwise stated, are based on the assumption that electrical wiring is serviceable. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

The diagnostic charts are written for single faults and are not fully effective for double faults.

This trouble shooting topic is based on the ground testing of the fireflaps and secondary air door systems in No. 1 engine bay (Ref. 71-31-00, Adjustment/Test); engine bay systems No.2 and 3 are similar. The system in No.4 engine bay is slightly difference. A number of relays and components in this topic are associated with other electrical circuits (Ref. Table 101). When these are removed or disturbed the

Isolation of services and testing is to be carried out in accordance with the relevant Adjustment/Test.

The following trouble shooting charts are included in this topic:

FIREFLAPS caption (20) illuminated with engine shut-down handle normal - Chart 106 para 7

SYSTEM TEST POINTS

Test point	UT 1867-6B	ENG 1)	Location 19-123
	UT 1869-6B	ENG 2)	Engine shut-down
	UT 1868-6B	ENG 3)	relay
	UT 1870-6B	ENG 4)	location 20-123
Test point	UT 1867-6A	ENG 1)	Location 19-123
	UT 1869-6A	ENG 2)	Engine shut-down
	UT 1868-6A	ENG 3)	handle
	UT 1870-6A	ENG 4)	location 20-123
Test point	UT 1867-6C	ENG 1)	Location 19-123
	UT 1869-6C	ENG 2)	Engine bay
	UT 1868-6C	ENG 3)	ventilation flap
	UT 1870-6C	ENG 4)	location 20-123
Test point	UT 1867-7A	ENG 1)	Location 19-123
	UT 1869-7A	ENG 2)	Flap indication
	UT 1868-7A	ENG 3)	control relay
	UT 1870-7A	ENG 4)	location 20-123
Test point	UT 1867-7B	ENG 1)	Location 19-123
	UT 1869-7B	ENG 2)	Flap indication
	UT 1868-7B	ENG 3)	inhibit relay
	UT 1870-7B	ENG 4)	Location 20-123
Test point	UT 1895-1B	ENG 1)	Location 11-123
	UT 1895-2B	ENG 2)	
	UT 1895-2B	ENG 3)	ADC slave relay
	UT 1895-1C	ENG 4)	

2. Secondary Air Doors, Using Aircraft Controls

A. Preparation

(1) Set the circuit breakers

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No.1			
SEC. AIR DOOR MTR. SUP.	2-213	1K247	C10
SHUT DOWN CONT.	3-213	1K253	F3
SEC. AIR DOOR POSN. IND.	1-213	1K238	F2
SEC. AIR DOOR CONT.	15-215	K236	D17
Engine No.2			
SEC. AIR DOOR MTR. SUP.	2-213	2K247	F10
SHUT DOWN CONT.	1-213	2K253	D1
SEC. AIR DOOR POSN. IND.	5-213	2K238	C3
SEC. AIR DOOR CONT.	15-216	K252	B11
Engine No.3			
SEC. AIR DOOR MTR. SUP.	4-213	3K247	A19
SHUT DOWN CONT.	1-213	3K253	D2
SEC. AIR DOOR POSN. IND.	5-213	3K238	C4
SEC. AIR DOOR CONT.	15-216	K252	B11
Engine No.4			
SEC. AIR DOOR MTR. SUP.	4-213	4K247	F19
SHUT DOWN CONT.	3-213	4K253	F4
SEC. AIR DOOR POSN. IND.	1-213	4K238	F3
SEC. AIR DOOR CONT.	15-215	K236	D17

(2) Isolate the services associated with the engine shut-down handle (E.S.D.H.) except secondary air doors.

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Place a warning placard at the 3CM position to the effect that the secondary air doors are being tested.

(5) Check the engine shut-down handle is reset (fully in).

(6) Establish communication between the 3CM position and the engine bay.

(7) Open, if necessary, the forward lower engine bay door, (Ref.71-00-00, Servicing).

B. Fault Finding

(1) Carry out the fault finding procedures (Ref. para 3).

C. Conclusion

(1) Ensure that the area is clean, close and lock the forward engine bay doors (Ref. 71-00-00, Servicing).

(2) Remove the intercomm.

(3) Remove the warning placard from the 3CM position.

(4) If not required for other servicing, disconnect ground power as detailed in 24-41-00.

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R 3. Trouble Shooting Using Aircraft Controls

```
   *****************************************
A. *Prepare to trouble shoot ref. para 2   *
   *Preliminary check before switching.    *
   *DOES MI (5) show SHUT with control     *
   *switch (8) in AUTO                     *
   *****************************************
         ||         |
         ||         |          -----------------------------------
         OK         -NOT OK--| 1a.If MI (5) shows OPEN-           |
         ||                  |    refer to Chart 108, para 3.     |
         ||                  |  b.If MI (5) shows CROSSHATCH      |
         ||                  |    - refer to CHART 103,para 3.    |
         ||                   -----------------------------------
         ||
   *****************************************
B. *Set the No.1 secondary air door control*
   *switch (8) to "OPEN".Check that        *
   *magnetic indicator MI(5) shows OPEN.   *
   *IF                                     *
   *****************************************
         ||         |
         ||         |
         ||         |          -----------------------------------
         ||         -NOT OK--|1a.If cb (12) is tripped -          |
         OK                  |   refer to Chart 101, para 3.      |
         ||                  | b.If cb (7) is tripped  -          |
         ||                  |   refer to Chart 102 para 3.       |
         ||                  | c.If No.1 engine shut-down         |
         ||                  |   handle is not fully in -         |
         ||                  |   reset handle (Ref.26-22-00).     |
         ||                   -----------------------------------
         ||                   -----------------------------------
         ||                  |2. Open No.1 engine bay doors(Ref  |
         ||                  |   71-00-00,Servicing)and by        |
         ||                  |   checking the position of the     |
         ||                  |   secondary air doors against      |
         ||                  |   the MI(5) verify the servic-     |
         ||                  |   eability of the indication       |
         ||                  |   circuit. If NOT OK - refer to    |
         ||                  |   Chart 103, para 3.               |
         ||                   -----------------------------------
         ||                   -----------------------------------
         ||                  |3. Refer to para 5, trouble         |
         ||                  |   shooting secondary air doors     |
         ||                  |   using test set.                  |
         ||                   -----------------------------------
```

```
          ||
    ****************************************
C.  *Set the control switch (8) to "AUTO".  *
    *Check MI(5) reads crosshatched then    *
    *SHUT. IF                               *
    ****************************************
          ||         |
          ||         |       ------------------------------------
          OK         -NOT OK--|Refer to Chart 104, para 3.       |
          ||                 ------------------------------------
          ||
    ******************************************************
D.  *With control switch (8) on AUTO utilize ADC  *
    *No.1 switches (Ref. 71-31-00 Adjustment/Test,*
    *to provide a > 0.26M signal, for engine No.1 *
    *and a > 220 Kt signal for engine No.4, check *
    *that MI shows OPEN.  Utilize ADC No. 2       *
    *switches for engines 2 & 3 (M > 0.26).      *
    ****************************************
          ||         |
          ||         |       ------------------------------------
          OK         -NOT OK--|Refer to Chart 109, para 3.      |
          ||                 ------------------------------------
          ||
    ****************************************
E.  *Set control switch (8) to "SHUT".Check *
    *that MI(5) shows crosshatched then SHUT*
    *IF                                     *
    ****************************************
          ||         |
          ||         |       ------------------------------------
          OK         -NOT OK--|Refer to Chart 105, para 3.      |
          ||                 ------------------------------------
          ||
    ****************************************
F.  *Reset ADC No.1 switches to "NORM" and  *
    *"OFF" and reset stick shaker cbs       *
    *previously tripped - Reset secondary   *
    *air door switch (8) to "AUTO", check   *
    *MI(5) remains on SHUT.                 *
    ****************************************
          ||         |
          ||         |       ------------------------------------
          OK         -NOT OK--|Refer to Chart 110, para 3       |
          ||                 ------------------------------------
          ||
    ****************************************
G.  *Revert to text para 2C Conclusion      *
    ****************************************
```

CIRCUIT BREAKER (12) FIRE FLAP POSITION - TRIPPING
(A) NORMAL
(B) WITH ENGINE SHUT-DOWN HANDLE PULLED

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLIES 200V,3PH, 400HZ, WITH A FOURTH NEUTRAL WIRE	-
TEST SET	TE5101
MULTIMETER	-

CAUTION: DO NOT OPERATE THE DOORS MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

NOTE: Before renewal of components * check wiring for continuity.

A.

```
-------------------        -------------------        -------------------
|Disconnect elec-  |-NO--|Check at pin A of|-YES-|Locate and         |
|trical connector  |     |cable connector  |     |rectify fault.     |
|from indication   |     |for earth fault  |     -------------------
|switch (15).      |     |or stray 115V ac.|
|                  |     -------------------
|Does cb (12)      |              |
|reset?            |              NO
|                  |              |
-------------------        -------------------
        |                  |Renew cb (12).   |
       YES                 -------------------
        |
-------------------        -------------------
|At connector of   |-NO--|Renew indication |
|switch (15) check |     |switch (15).     |
|insulation bet-   |     -------------------
|ween pins A-B,    |
|A-C, with         |
|switches closed.  |
|Satisfactory      |
-------------------
        |
       YES
        |
```

R

Chart 101 (Sheet 1 of 3)

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```
           |
          YES
           |
 -------------------        ---------------
|Check wiring be-   |-NO--|*Renew MI (5)|
|tween switch (15)|         ---------------
|cable connector   |
|and MI (5)        |
|Pin B-terminal C  |
|Pin C-terminal A  |
|for earth fault.  |
 -------------------
           |
          YES
           |
           |
 -------------------
|Locate and rect-  |
|ify fault in      |
|wiring.           |
 -------------------
```

R Chart 101 (Sheet 2 of 3)

B.

```
-------------------        -------------------
|Reset engine      |-YES-|Revert to checks  |
|shut-down handle;|      |in Chart 101,     |
|check if cb (12) |      |part A.           |
|still trips      |      -------------------
-------------------
         |
         NO
         |
         |
-------------------        -------------------
|Remove relay (4).|-YES-|Locate and recti-|
|Check at test    |      |fy fault between |
|point UT1867/7A  |      |relay (4) and    |
|panel 19-123     |      |relay (2).       |
|for earth fault. |      -------------------
-------------------
         |
         NO
         |
         |
-------------------        -------------------
|Link B2 to B3 on |-YES-|Renew relay (4). |
|relay (4). Pull  |      -------------------
|ESDH, does cb    |
|(12) hold in?    |
-------------------
         |
         NO
         |
         |
-------------------
|*Renew fire flaps|
|caption (20).    |
-------------------
```

R Chart 101 (Sheet 3 of 3)

CIRCUIT BREAKER (7), SECONDARY AIR DOOR MOTOR CONTROL - TRIPPING

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLES 200V, 3 PHASE, 28V d.c.	-
MULTIMETER	-

<u>CAUTION</u>: 1. DO NOT OPERATE THE DOORS MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

2. IF THE DRIVE IS DISCONNECTED FROM THE MOTOR AND TURNED, IT MUST BE ROTATED IN THE OPPOSITE DIRECTION THE SAME NUMBER OF TURNS AND RECONNECTED TO THE MOTOR TO RETAIN THE SYSTEM SETTINGS (Ref. 71-31-14).

<u>NOTE</u>: Before renewal of components * continuity test the wiring.

```
-------------------        ------------------        ------------------
|Disconnect the   |-YES-|Check for S/C on |-NO--|Trouble Shoot    |
|plug from the    |     |motor phase      |     |using Test Set   |
|motor (9) - will |     |winding          |     |Para. 5          |
|cb (7) reset     |     ------------------        ------------------
-------------------              |
        |                       YES
        |                        |
        NO                 ------------------
        |                  |Renew Motor     |
        |                  ------------------
        |                        |
```

Chart 102 (Sheet 1 of 2)

Operate the control switch (8) with cb (7) reset to isolate the fault to one or more switch settings - is the fault applicable to one position?

-YES-

a. Cb trips in OPEN - locate and rectify earth fault in wiring between switch (8) and motor plug.

b. Cb trips in SHUT - locate and rectify earth fault in wiring.

c. Cb trips in AUTO locate and rectify earth fault in wiring, relay (1) or relay (3).

NO

Check for 115V at terminals 5 & 11 of switch (8) with switch at AUTO.

-YES-

*Renew switch (8)

NO

Locate and rectify fault in wiring or renew cb (7).

R

Chart 102 (Sheet 2 of 2)

SECONDARY AIR DOORS OPERATE BUT MI(5) DOES NOT INDICATE DOOR POSITION CORRECTLY

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO
TORQUE LIMITING SCREWDRIVER RANGE: 25-30 lbf in (0.29 - 0.34 mdaN)	-
CIRCUIT BREAKER	-
SAFETY CLIPS	-
TEST SET	TE 5101
INTERPHONE EQUIPMENT	-
POWER SUPPLY: 200V, 3 PHASE, 400 Hz, WITH A FOURTH NEUTRAL WIRE	-
MULTIMETER	-

CAUTION: DO NOT OPERATE THE DOORS MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

NOTE: Before renewal of components* continuity test the wiring.

```
-------------------                     -------------------                    -------------------
|Check for 28V at |-NO--|Check for 28V at |-YES-|Locate and         |
|pin A of plug to |     |circuit breaker  |     |rectify O/C in     |
|indication switch|     |(12).            |     |cable.             |
|(15).            |     -------------------     -------------------
-------------------              |
         |                       NO
        YES                      |
         |               -------------------
         |               |Renew cb (12)    |
         |               -------------------
```

R

Chart 103 (Sheet 1 of 2)

Connect test set to switch(15) and operate the secondary air doors. Check the indication switch (15) with test set(Ref 71-31-16 Adjustment/Test para 4) If satisfactory

-NO-- Check flexible drive shaft is turning ind. switch.

--NO- Renew drive shaft (23).

YES (from Check flexible drive shaft): *Renew switch (15)

YES (from Connect test set): Disconnect test set, reconnect the aircraft supply to indication switch (15) and check for 28Vdc at MI (5) terminal C for the OPEN circuit and terminal A for the SHUT circuit. If

--NO- Locate and rectify fault in cable.

YES: Check for O/C fault at terminal B.

-YES- Locate and rectify fault in cable.

NO: Renew MI (5).

R Chart 103 (Sheet 2 of 2)

SECONDARY AIR DOORS DO NOT CLOSE WHEN AUTO SELECTED ON GROUND

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLIES 200V, 3 PHASE, 28V d.c.	-
MULTIMETER	

<u>CAUTION</u>: DO NOT OPERATE THE DOORS MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

<u>NOTE</u>:
1. Before renewal of a component* check wiring for continuity.
2. Engines 1 and 4 are controlled by No.1 ADC, engines No 2 and 3 by No.2 ADC.

Is secondary air door motor control cb (19) set? -NO-- Ref Chart 107, para 3.

YES

Is fault evident on associated engine? -YES- Refer to Chart 106, para 3

NO

Select SHUT on control switch(8) Check MI(5) shows crosshatched then SHUT. -NO-- Ref.Chart 105 Para 3,sec.air doors fail to close when selected SHUT.

YES

R

Chart 104 (Sheet 1 of 3)

```
                |
 -------------------      -------------------
|Check handle (18)|-NO--|Reset handle (Ref|
|is fully in      |      |26-22-00)         |
 -------------------      -------------------
                |
               YES
                |
 -------------------      -------------------      -------------------
|Check at test    |-NO--|Check that ADC No|-YES-|Refer to Chart    |
|point 1867/1 B,  |      |1 rotary switch  |      |106, para 3       |
|panel 19-123,that|      |(21) is set to   |      -------------------
|pull-in coil of  |      |NORM.            |
|relay (3) is de- |       -------------------
|energized.       |
 -------------------
                |
               YES
                |
 -------------------      -------------------      -------------------
|Check for 115V ac|-YES-|Check for 115V ac|-YES-|*Renew relay (3).|
|at terminals A2  |      |at terminal A3   |       -------------------
|and B2 of relay  |      |and B3 of relay  |
|(3) with switch  |      |(3) with ESDH    |
|(8) at AUTO.     |      |pulled.          |
 -------------------      ===================
                |                   |
                |                  NO
                |                   |
                |         -------------------      -------------------
                |        |Check continuity |-YES-|Renew relay (1). |
                |        |between relays   |       -------------------
                |        |(1) and (3) term-|
                |        |inal 2 and A3    |
               NO        |     4 and B3    |
                |         -------------------
                |                   |
                |                  NO
                |                   |
                |         -------------------
                |        |Locate and recti-|
                |        |fy O/C between   |
                |        |relays (1) and(3)|
                |         -------------------
```

Chart 104 (Sheet 2 of 3)

```
 ------------------     ------------------      ------------------
|Check for 115V ac|-YES-|Check continuity |-YES-|*Renew relay (1).|
|at terminals A   |     |between relays   |      ------------------
|and B of relay(1)|     |(1) and (3) term-|
 ------------------     |inal 1 and A2    |
         |              |      3 and B2   |
         |               ------------------
         |                      |
         NO                     NO
         |                      |
         |               ------------------
         |              |Locate and recti-|
 ------------------     |fy O/C between   |
|Check for 115V ac|     |relays (1)and(3).|
|at terminals 6   |      ------------------
|and 12 of switch |      ------------------
|(8)              |-YES-|Locate and recti-|
 ------------------     |fy O/C between   |
         |              |relay (1) and    |
         NO             |switch (8).      |
         |               ------------------
 ------------------
|*Renew switch (8)|
 ------------------
```

Chart 104 (Sheet 3 of 3)

```
******************************      ------------------------------------
* SECONDARY AIR DOORS FAIL   *      | GROUND EQUIPMENT REQUIRED        |
* TO CLOSE WHEN SELECTED     *      ------------------------------------
* SHUT ON CONTROL SWITCH (8)*       | DESCRIPTION             PART NO. |
******************************      ------------------------------------
                                    |POWER SUPPLIES                    |
                                    |200V, 3 PHASE,                    |
                                    |28V d.c.                    -     |
                                    |MULTIMETER                  -     |
                                    ------------------------------------
```

CAUTION: DO NOT OPERATE SECONDARY AIR DOORS MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

NOTE: Before renewal of components *continuity test the wiring.

```
-------------       -------------
|Check if cb|-YES-|Refer to    |
|(7) has    |     |Chart 102,  |
|tripped.   |     |para 3.     |
-------------     -------------
      |
      NO
      |
-------------     -------------     -------------
|Open access|-YES-|Is the      |-NO--|Engage     |
|panel and  |     |drive       |     |drive at   |
|check motor|     |centre core|      | both ends |
|(9) is run-|     |engaged     |     |check      |
|ning -     |     |with the:   |     |system     |
|audible?   |     |(a) motor   |     | settings  |
-------------     |(b) screw-  |     -------------
      |           |jack.       |
      |           -------------
      |                 |
      NO               YES
      |                 |
      |           -------------     -------------
      |           |Is the      |-YES-|Renew drive|
      |           |drive shaft|      |shaft (23) |
      |           |broken.     |     -------------
      |           -------------
      |                 |
      |-----------------NO
      |
```

Chart 105 (Sheet 1 of 2)

```
-------------      -------------      -------------      -------------
|Check for  |-NO--|a. No.115V |-NO--|Check cb(7)|-NO--|Renew cb(7)|
|115V ac    |     |   at B    |     |terminal B2|      -------------
|pins C, A &|     |           |     |for 115V ac|
|B of motor |     |b. No.115V |-NO- -------------
|(9) plug.  |     |   at C    |           |
-------------     |           |           -----------------
      |           |c. No.115V |------------               |
      |           |   at A    |           |               |
     YES           -------------          NO             YES
      |                                   |               |
      |                                   |          -------------
      |                                   |          |Locate &   |
      |                                   |          |rectify O/C|
      |                                   |          |in wiring  |
      |                                   |          |between cb |
      |                                   |          |(7) and mo-|
      |                                   |          |tor (9).   |
      |                                   |          -------------
-------------                       -------------     -------------
|*Renew mo- |                       |Check swit-|-NO--|Renew swit-|
|tor (9).   |                       |ch (8) ter-|     |ch (8).    |
-------------                       |minals 3 & |     -------------
                                    |9 for 115V |
                                    -------------
                                          |
                                         YES
                                          |
                                    -------------
                                    |Locate and |
                                    |rectify O/C|
                                    |in wiring  |
                                    |between sw-|
                                    |itch (8)   |
                                    |and motor  |
                                    |(9).       |
                                    -------------
```

Chart 105 (Sheet 2 of 2)

SECONDARY DOOR MOTOR CONTROL RELAY (3) ENERGIZED AIRCRAFT ON GROUND - DOOR OPEN

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLIES 28V d.c.	-

CAUTION: ADC (21) IS ASSOCIATED WITH OTHER CIRCUITS (REF.TABLE 101 PARA 7).

NOTE: Before renewal of components* continuity test the wiring.

Check ADC No 1 rotary test switch (22) is set to NORM. -NO-- Set test switch (22) to NORM.

YES

Trip cb (19). Does relay (3) de-energize? -NO-- Remove relay (16) Does relay (3) de-energize? -NO-- Locate and rectify earth fault between relays (3) and (16).

YES (from Trip cb (19)) / YES (from Remove relay (16)) → Renew relay (16).

At test point UT-1895/1B check for O/C. -YES- Renew relay (16).

NO

*Renew ADC (21).

Chart 106

CIRCUIT BREAKER (19) SECONDARY AIR DOOR MOTOR CONTROL - TRIPPING

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLES	
28V d.c.	-
MULTIMETER	-

NOTE: Before renewal of components * check wiring for continuity.

```
------------------   ------------------   ------------------
|Will cb (19)    |-YES-|Check relay (16) |-YES-|*Renew relay (16)|
|reset?          |   |terminal A1 to C1|   ------------------
------------------   |for S/C.         |
        |            ------------------
        NO                   |
        |                    NO
        |                    |
------------------   ------------------   ------------------
|Check relay (16) |-NO--|Check cable bet- |-YES-|Locate and recti-|
|terminal A1 to D1|   |ween terminal 2  |   |fy cable fault.  |
|for S/C across   |   |of cb (19) and   |   ------------------
|coil.            |   |A1 relay (16) for|
------------------   |earth fault or   |
        |            |stray 115V.      |
        |            ------------------
        YES                  |
        |                    NO
        |                    |
------------------   ------------------
|*Renew relay (16)|   |Renew cb (19).   |
------------------   ------------------
```

Chart 107

SECONDARY AIR DOORS OPEN WITH SWITCH (8) IN AUTO ON THE GROUND

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLIES	
200V, 3 PHASE	-
28V d.c.	-
MULTIMETER	-

CAUTION: ADC NO.1 (21) IS ASSOCIATED WITH OTHER CIRCUITS (Ref. Table 101 para 7).

NOTE: Before renewal of components * check wiring for continuity.

```
-------------------            ------------------
|Check ADC No.1    |-NO--|Select NORM.     |
|test switch (22)  |     ------------------
|is selected NORM.|
-------------------
         |
        YES
         |
-------------------            ------------------
|Select secondary  |-NO--|Ref Chart 105,   |
|air door control  |     |Para 3 doors will|
|switch (8) to     |     |not close when   |
|"SHUT".           |     |selected SHUT.   |
-------------------            ------------------
         |
        YES
         |
-------------------
|Door SHUT but     |
|opens immediately|
|when switch is    |
|centred in AUTO.  |
-------------------
         |
        YES
         |
```

R Chart 108 (Sheet 1 of 2)

```
------------------      ------------------      ------------------
|Check at test    |-NO--|Check across term|-NO--|Locate and recti-|
|point UT1867/1B  |     |inals B2 to B1,  |     |fy wiring fault  |
|panel 19-123 for |     |A2 to A1 relay   |     |between relay (3)|
|earth fault.     |     |(3) for continu- |     |and motor (9).   |
------------------      |ity.             |     ------------------
        |               ------------------
       YES                      |
        |                      YES
------------------              |
|Check at test    |     ------------------
|point UT1895/1B  |     |*Renew relay (3).|
|panel 11-123 for |     ------------------
|earth fault.     |--NO-----------
------------------              |
        |
       YES              ------------------      ------------------
        |               |Check across ter-|-NO--|Renew relay.     |
------------------      |minal B2 and D3  |     ------------------
|Check across ter-|     |for O/C.         |-YES-----------
|minals C61 ADC   |     ------------------              |
|(21) for continu-|
|ity.             |-YES------------------               |
------------------      |*Renew ADC (21). |             |
        |               ------------------              |
        NO                                              |
        |                                               |
------------------                              ------------------
|Locate and recti-|                             |Locate and recti-|
|fy earth fault in|                             |fy wiring fault  |
|cable between C1 |                             |between relays(3)|
|relay (16) and   |                             |and (16).        |
|terminal on ADC  |                             ------------------
|(21).            |
------------------
```

Chart 108 (Sheet 2 of 2)

```
*****************************
* SECONDARY AIR DOORS WILL  *
* NOT OPEN IN AUTO ON THE   *
* GROUND WITH THE ADC       *
* SWITCHES ON TEST          *
*****************************
```

GROUND EQUIPMENT REQUIRED	
DESRIPTION	PART NO.
POWER SUPPLIES 200V, 3 PHASE, 400Hz, 28V d.c.	-
MULTIMETER	-

CAUTION: ISOLATE STICK SHAKER CIRCUIT BREAKER WHEN TESTING SECONDARY AIR DOORS FROM ADC SWITCHES (Ref. 27-38-11).

NOTE: Before renewal of a component * check wiring for continuity.

```
------------------        ------------------
|Check at test   |-NO--|Refer to Chart   |
|point 1867/1A and|     |106, para 3.     |
|B for 115V across|     ------------------
|coil of relay (3)|
|secondary door   |
|motor control    |
|relay.           |
------------------
        |
       YES
        |
------------------        ------------------
|Check for 115V ac|-YES-|Check motor      |
|at pins D and F  |     |wiring with test |
|of plug to motor |     |set, para.5      |
|(9).             |     ------------------
------------------
        |
        NO
        |
```

R Chart 109 (Sheet 1 of 2)

```
         |
------------------     ------------------
|Check continuity |-NO--|Locate and recti-|
|between relay (3)|     |fy O/C.          |
|and motor term-  |     ------------------
|inals/pins,      |
|     D and B1    |
|     F and A1    |
------------------
         |
        YES
         |
------------------     ------------------
|Check continuity |-NO--|Locate and recti-|
|between relay (1)|     |fy O/C.          |
|& (3) terminals  |     ------------------
|     1 & A2      |
|     3 & B2      |
------------------
         |
        YES
         |
------------------
|Renew Relay (3)  |
------------------
```

R Chart 109 (Sheet 2 of 2)

SECONDARY AIR DOORS WILL NOT REMAIN SHUT IN AUTO AFTER ADC TEST OR AUTO OPEN POSITION

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO
POWER SUPPLIES 200V, 3 PHASE 28V d.c.	-
MULTIMETER	-

CAUTION: LANDING GEAR DOWNLOCK RELAY (17) IS ASSOCIATED WITH OTHER CIRCUITS (Ref.Table 101 para 7).

NOTE: Before renewal of components* check wiring for continuity.

Is landing gear downlock relay (17) energised-check for O/C across terminals Xl and X2?
- NO → Refer to trouble shooting on undercarriage switch services (Ref.32-61-00).
- YES ↓

Check for 28V dc at terminal B2 of relay (17).
- NO → Check for earth fault on cable between terminal D1 of relay (3) and B2 relaY (17).
- YES ↓

*Renew relay (3)

R

Chart 110

SECONDARY AIR DOORS MI SHOWS OPEN BUT CB (7) TRIPS

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO
POWER SUPPLIES 200V, 3 PHASE	-
TEST SET	TE5101

CAUTION: DO NOT OPERATE THE DOORS MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

Reset cb (7) and select SHUT - will doors close?

- NO: (a) cb(7) tripping (Ref. para.3 Chart 102)
  (b) Motor stops, doors not shut - check/adjust datum setting (Ref.71-31-14 Adjustment/Test
- YES:

In the engine bay check each door position - are all the door closed?

- NO: Renew or reconnect drive shaft, as necessary, (Ref. 71-31-14, Removal/ Installation
- YES:

Select OPEN - is cb (7) still tripping

- YES:

*Renew motor

Chart 111

4. Secondary Air Door Using Test Set

A. Prepare

(1) Trip circuit breakers para 2 and fit safety clips.

R (2) Open motor access panel 411NB.

(3) Place a warning placard at the 3CM position stating that the secondary air doors are being tested.

(4) Open the forward lower engine bay door (Ref. 71-00-00, Servicing).

(5) Connect the test set to the motor and indicating switch unit (Ref.71-31-00, Adjustment/Test), and to a power source.

(6) For component identification refer to Table 101.

(7) Remove, if necessary, the intake rings (Ref. 71-21-11, Removal/Installation).

B. Fault Finding

(1) Carry out the fault finding procedures (Ref. para. 5).

C. Conclusion

(1) Check that the area is clean and refit the intake rings (Ref.71-21-11, Removal/Installation).

(2) Disconnect and remove the test set from the motor and indication switch unit (Ref.71-31-00, Adjustment/Test). Reconnect the aircraft supply to the motor and indication switch.

(3) Close and lock the forward engine bay door (Ref. 71-00-00, Servicing).

(4) Remove the warning placard from the 3CM position.

(5) Close the motor access panel 411NB.

(6) Set the circuit breakers previously tripped.

(7) Carry out an operational test of the secondary air doors (Ref.71-31-00, Adjustment/Test).

R 5. Trouble Shooting Using Test Set

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO
TORQUE LIMITING SCREW - DRIVER RANGE: 25-30 lbf in (0.29-0.34 (mdaN)	
CIRCUIT BREAKER SAFETY CLIPS	-
TEST SET	TE 5101
INTERPHONE EQUIPMENT - ELECTRICAL POWER SUPPLY: 200V, 3PHASE, 400 Hz WITH A FOURTH NEUTRAL WIRE	

CAUTION: 1. DO NOT OPERATE SECONDARY AIR DOORS MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

2. IF ANY COMPONENT IS DISCONNECTED FROM THE DRIVE SYSTEM IT MUST BE RECONNECTED IN THE SAME RELATIVE POSITION WITHOUT DISTURBING THE EQUIPMENT SETTINGS.

```
    ****************************************
A.  *Prepare to trouble shoot Ref para 4.  *
    *Check that the phase integrity lights *
    *are on, and the GO light. Select "OPEN"*
    *on the motor switch, and press the    *
    *INCHING CONTROL BUTTON                *
    ****************************************
          ||         |
          ||         |      ----------------------------------
          OK         -NOT OK--|Test set cb tripping or motor(9)|
          ||                  |will not start - Ref. Chart 101,|
          ||                  |para 5.                         |
          ||                  ----------------------------------
          ||
    ****************************************
B.  *Run the doors fully "OPEN" and check  *
    *that the system functions as described *
    *in 71-31-14 A/T para. 4.              *
    ****************************************
          ||    |    |
```

```
        ||    |     |       -------------------------------------
        ||    |     -NOT OK--|Test set OPEN or SHUT indicator  |
        ||    |              |lights not operating correctly   |
        ||    |              |- Ref. Chart 103                 |
        ||    |              -----------------------------------
        ||    |
        ||    |              -----------------------------------
        OK    -----NOT OK----|With the drive in the shut       |
        ||                   |position, disconnect the motor   |
        ||                   |from drive (Ref. 71-31-14 R/I);  |
        ||                   |run the motor. If OK refer to    |
        ||                   |Chart 102, para 5.               |
        ||                   -----------------------------------
        ||                                  |
        ||                               NOT OK
    *****************************************     |
C.  *Select "SHUT" on the MOTOR switch and  *     |
    *press the INCHING CONTROL BUTTON.Check *     |
    *that the doors close fully in the      *     |
    *manner described in 71-31-14 A/T para 4*     |
    *****************************************     |
        ||          |                             |
        ||          |        -----------------------------------
        ||          |        |a.Motor fails in motion,cb       |
        ||          |        |  may trip - any one phase)      |
        ||          |        |             open, S/C    )      |
        ||          |        |           - motor clutch )      |
        OK          -NOT OK--|             failure      )      |
        ||                   |                          )renew|
        ||                   |b.Motor excessive time to )motor|
        ||                   |  open or  - brake        ) (9) |
        ||                   |  close      failure      )      |
        ||                   |                          )      |
        ||                   |c.Does not switch off     )      |
        ||                   |           - limit switch )      |
        ||                   |             failure      )      |
        ||                   -----------------------------------
        ||
    *****************************************
D.  *Revert to text, para 4C Conclusion     *
    *****************************************
```

```
***************************
*TEST SET CIRCUIT         *
*BREAKER TRIPPING         *
*OR MOTOR (9) WILL NOT    *
*START                    *
***************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO
POWER SUPPLIES 200V d.c. 3 PHASE 400 Hz	-
TEST SET	TE 5101

CAUTION: DO NOT OPERATE THE SECONDARY AIR DOORS MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

```
 ---------------------------------         ------------------------
|Check that test set supply is    |-NO--|Correct electrical      |
*200V, 3 phase 400 Hz, that       *     |supply anomalies.       |
|phase integrity lights are       |      ------------------------
|illuminated and GO light is on.  |
 ---------------------------------
               |
              YES
               |
 ---------------------------------         ------------------------
|Check for open or S/C at         |--NO-|Is motor overloaded -   |
|motor (9) receptacle pins        |     |drive excessive         |
|B C & A for SHUT, B F & D        |     |friction-Chart 102.     |
|for OPEN.                        |      ------------------------
 ---------------------------------
               |
              YES
               |
 ---------------------------------
|Renew motor (9).                 |
 ---------------------------------
```

R

Chart 101

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EXCESSIVE FRICTION OR SEIZURE OF THE SECONDARY AIR DOORS DRIVE SYSTEM

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
HANDBRACE	-

CAUTION: 1.BEFORE TURNING THE DRIVE SHAFT NOTE THE INDICATION SWITCH POSITION,IF THE SWITCH IS ON SHUT AND THE DRIVE IS ROTATED INADVERTENTLY FURTHER IN THE SHUT DIRECTION THE SWITCH MAY BE DAMAGED. THE SAME REASONING APPLIES TO THE OPEN POSITION.

Using a handbrace secured to the motor end of the flexible drive system (23), turn the drive - it should be quite free. Count the number of turns.

- YES: Turn the drive in the opposite sense the same number of turns and reconnect to the motor (9).
- NO: Is any secondary air door, (25) (26) (27) & (28) out of alignment.
  - YES: Examine the flexible drive on either side of the door, is the drive sheared, has an end ferrule failed, is the drive core out of engagement with the screwjack?
    - YES: Renew flexible drive shaft (23)
    - NO: Check the affected door/screwjack (24) combination for seized door or fracture of the door jack attachment - Renew defective part.
  - NO: (continued)

R

Chart 102 (Sheet 1 of 2)

```
            |
            |
    ------------------     ------------------
    |Check the indica-|-YES-|Renew switch (15)|
    |tion switch (15) |     ------------------
    |for partial or   |
    |complete seizure.|
    ------------------
            |
            NO
            |
    ------------------     ------------------
R   |Starting from the|-YES-|Lubricate (Ref.  |
R   |motor end discon-|     |71-31-13) or re- |
    |nect and check   |     |new the defective|
    |each drive shaft |     |drive shaft (23).|
    |in turn for exce-|     ------------------
    |ssive torque or  |
    |seizure.         |
    ------------------
            |
            NO
            |
    ------------------     ------------------
    |Check each screw-|-YES-|Disconnect the   |
    |jack (24) and    |     |screwjack (24)   |
    |door (25) (26)   |     |from the door    |
    |(27) (28) for ex-|     |(25, (26) (27)   |
    |cessive torque by|     |(28) check each  |
    |turning its input|     |item independent-|
    |shaft, turn the  |     |ly for freedom   |
    |screwjack in the |     |of movement -    |
    |opposite sense   |     |rectify or renew |
    |the same number  |     |the door or      |
    |of turns.        |     |screwjack        |
    ------------------     ------------------
            |
            NO
            |
    ------------------
    |Renew motor.     |
    ------------------
```

R Chart 102 (Sheet 2 of 2)

```
*****************************
* SECONDARY AIR DOORS OPER- *
* ATE ON THE TEST SET WITH  *
* ONE OR MORE INDICATION    *
* LIGHTS INOPERATIVE OR IN- *
* CORRECTLY SEQUENCED.      *
*****************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 200V AC, 3 PHASE, 400 HZ	-
TEST SET	TE5101
MULTIMETER	-

CAUTION: CAUTION BEFORE TURNING THE DRIVE SHAFT NOTE THE INDICATION SWITCH POSITION, IF THE SWITCH IS ON SHUT AND THE DRIVE IS ROTATED INADVERTENTLY FURTHER IN THE SHUT DIRECTION THE SWITCH MAY BE DAMAGED. THE SAME REASONING APPLIES TO THE OPEN POSITION.

```
------------------      ------------------
|Operate the doors|-NO--|Check for sheared|
|from the test set|     |or defective     |   ------------------
|- is the drive   |     |drive shaft.     |-YES-|Renew flexible  |
|turning the      |     |Note: It is poss-|     |drive shaft (23)|
|switch (15)?     |     |ible to have a   |     ------------------
------------------      |flexible drive   |
        |               |connected with   |
       YES              |the inner core   |
        |               |out of engagement|
        |               ------------------
------------------               |
|Operate the doors|              |
|from the test set|              NO
|and check for    |              |
|continuity across|     ------------------
|pins A and C at  |-NO--|Renew switch (15)|
|SHUT and across  |     ------------------
|pins A and B at  |
|OPEN.            |
------------------
        |
       YES
        |
```

Chart 103 (Sheet 1 of 2)

```
            |
 -------------------
|Carry out the     |
|datum setting     |              --------------------
|check on the      |-NO--|Renew switch (15)|
|switch (71-31-16 |              --------------------
|A/T) - satis-     |
|factory?          |
 -------------------
            |
           YES
            |
 -------------------
|Refit switch (15)|
|to the aircraft. |
 -------------------
```

R Chart 103 (Sheet 2 of 2)

6. Fireflaps

A. Preparation

(1) Set the circuit breakers:

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No.1			
BAY COOLING FLAP CONT. & IND.	3-213	1K231	F1
SEC. AIR DOOR MTR. SUP.	2-213	1K247	C10
SHUT DOWN CONT.	3-213	1K253	F3
SEC. AIR DOOR POSN. IND.	1-213	1K238	F2
SEC. AIR DOOR CONT.	15-215	K236	D17
Engine No.2			
BAY COOLING FLAP CONT. & IND.	1-213	2K231	D3
SEC. AIR DOOR MTR. SUP.	2-213	2K247	F10
SHUT DOWN CONT.	1-213	2K253	D1
SEC. AIR DOOR POSN. IND.	5-213	2K238	C3
SEC. AIR DOOR CONT.	15-216	K252	B11
Engine No.3			
BAY COOLING FLAP CONT. & IND.	1-213	3K231	D4
SEC. AIR DOOR MTR. SUP.	4-213	3K247	A19
SHUT DOWN CONT.	1-213	3K253	D2
SEC. AIR DOOR POSN. IND.	5-213	3K238	C4
SEC. AIR DOOR CONT.	15-216	K252	B11
Engine No.4			
BAY COOLING FLAP CONT. & IND.	3-213	4K231	F2
SEC. AIR DOOR MTR. SUP.	4-213	4K247	F19
SHUT DOWN CONT.	3-213	4K253	F4
SEC. AIR DOOR POSN. IND.	1-213	4K238	F3
SEC. AIR DOOR CONT.	15-215	K236	D17

(2) Isolate the services associated with the engine shut-down handle with the exception of the fireflaps (Ref.26-22-00).

(3) Place a warning placard at the pilots' roof panel and at the 3CM position stating that the fireflaps are being tested.

(4) Open, if necessary, the forward lower engine bay door (Ref.71-00-00, Servicing).

(5) Make available electrical ground power (Ref. 24-41-00).

(6) For component identification refer to Table 101.

B. Fault Finding

(1) Carry out the fault finding procedures.

C. Conclusion

(1) Disconnect and remove electrical ground power as detailed in 24-41-00.

(2) Close and lock the forward lower engine bay door. (Ref.71-00-00, Servicing).

(3) Remove the warning placards at the 3CM position and roof panel.

(4) Restore the services associated with the engine shut-down handle previously isolated (Ref.26-22-00).

7. Trouble Shooting Fire Flaps

CAUTION: 1. DO NOT OPERATE THE FIREFLAPS MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

2. THE ENGINE SHUT-DOWN HANDLE (18),(48),(78),(108); THE RELAY (17)(31)(61)(91) AND THE LANDING GEAR DOWNLOCK SWITCH (17)(47)(77)(107) ARE PART OF
R OTHER CIRCUITS (TABLE 101 PARA 7).

```
    *****************************************
A.  *Prepare to trouble shoot (Ref para 6). *
    *Check FIREFLAPS caption illuminates    *
    *using flight deck lights test switch   *
    *on pilots' roof panel.                 *
    *****************************************
          ||         |
          ||         |         ----------------------------------
          OK         -NOT OK--|Renew caption (20) filament      |
          ||                   ----------------------------------
          ||
    *****************************************
    *Pull shut-down handle (18) - check     *
    *that the green FIREFLAPS caption (21)  *
    *illuminates, and externally, that      *
    *the engine bay ventilation flap (29)   *
    *is shut.                               *
    *****************************************
          ||         |
          ||         |
          ||         |         -----------------------------------
          OK         -NOT OK--|Does MI (5) indicate SHUT, if so  |
          ||                  |refer to para.3 Chart 105, If     |
          ||                  |not -                             |
          ||                   -----------------------------------
          ||                                    |
    *****************************************   |
    *Reset shut-down handle (19) - check    *  NOT OK
    *that the FIREFLAPS caption (20) goes   *   |
    *out and the engine bay ventilation     *   |
    *flap (29) is open                      *   |
    *****************************************   |
          ||         |                          |
          OK         |         -----------------------------------
          ||         |        |Refer to Chart 101, para. 7       |
          ||         |         -----------------------------------
          ||         |
```

```
      ||          |          ------------------------------------
      OK          -NOT OK--|Refer to Chart 106, para. 7.       |
      ||                     ------------------------------------
      ||
*****************************************
*Revert to text, para. 6 C              *
*Conclusion                             *
*****************************************
```

```
*****************************
* HANDLE (18) PULLED CAPTION*
* (20) FAILS TO ILLUMINATE  *
*****************************
```

GROUND EQUIPMENT REQUIRED

DESCRIPTION	PART NO.
POWER SUPPLIES 200V, 3 PHASE, 400 Hz	-
MULTIMETER	-

NOTE: Before renewal of components * check wiring for continuity.

```
------------------        ------------------
|Does MI(5) show  |-NO--|Refer to second- |
|SHUT?            |     |ary air doors    |
------------------      |trouble shooting |
        |               |para 3, Chart    |
       YES              |105              |
        |               ------------------
        |
------------------        ------------------
|Check that engine|-NO--|Refer to Chart   |
|bay ventilation  |     |102.             |
|flap (29) is shut|     ------------------
------------------
        |
       YES
        |
------------------        ------------------        ------------------
|Check for 28 V   |-NO--|Check continuity |-NO--|Renew actuator   |
|dc at test point |     |between terminals|     |(13).            |
|UT1867/6C panel  |     |E & C, actuator  |     ------------------
|19-123.          |     |(13).            |
------------------      ------------------
        |                       |
        |                      YES
        |                       |
        |               ------------------
        |               |Locate and recti-|
        |               |fy fault in cable|
       YES              |between terminal |
        |               |E of actuator(13)|
        |               |and 7 of relay(2)|
        |               ------------------
```

Chart 101 (Sheet 1 of 2)

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```
         |
         |
 -------------------                                        -------------------
|Check continuity  | -------------NO------------ |Locate and recti-|
|to earth from     |                             |fy O/C.          |
|terminal 3 of     |                              -------------------
|relay (2).        |
 -------------------
         |
        YES
         |
 -------------------         -------------------          -------------------
|Check for 28Vdc   |-NO--|Check for 28V at  |-NO--|Check wiring for  |
|at test point UT  |     |terminal B3 of    |     |O/C between relay |
|1867-7A           |     |relay (4)         |     |(4) and junction  |
 -------------------      -------------------     |in panel 19/123   |
         |                        |                -------------------
        YES                       |
         |                        |
 -------------------              |
|Check for earth   |             YES
|at test point UT  |              |
|1867-7B.          |              |
 -------------------              |
         |                        |
        YES                       |
         |                        |
 --------------------      -------------------     -------------------
|Locate and rectify|     |Check for 28V dc|-NO--|Locate and recti-|
|earth fault       |     |at terminal 2 of|     |fy O/C in cable  |
 --------------------    |caption (20)    |     |between terminal |
                          ------------------    |2 of caption (20)|
                                  |             |and B2 of relay  |
                                 YES            |(4)              |
                                  |              -------------------
                          ------------------
                         |Renew caption   |
                         |(20)            |
                          ------------------
```

Chart 101 (Sheet 2 of 2)

```
*****************************    ------------------------------------
* HANDLE (18) PULLED ENGINE *    | GROUND EQUIPMENT REQUIRED        |
* BAY VENTILATION FLAP (29) *    ------------------------------------
* IS NOT SHUT               *    | DESCRIPTION           PART NO.   |
*****************************    ------------------------------------
                                 |POWER SUPPLES             -       |
                                 |28V d.c.                          |
                                 |MULTIMETER                -       |
                                 ====================================
```

NOTE: Before renewal of components * check the wiring for continuity.

```
------------------       ------------------
|Has actuator (13)|-YES-|Locate and recti-|
|extended?        |      |fy either mech-  |
------------------       |anical failure   |
         |               |of the flap      |
         |               |mechanism or     |
         |               |failure of the   |
         NO              |actuator mounting|
         |               |to forward engine|
         |               |bay door.        |
         |               ------------------
         |
------------------       ------------------
|Are cb's (10) and|-YES-|a. Cb(10) trip-  |
|(11) tripped?    |      |   ping Chart 103|
------------------       |b. Cb(11) trip-  |
         |               |   ping Chart 104|
         NO              ------------------
         |
------------------       ------------------          ------------------
|Remove plug from |-YES-|Check for O/C    |-YES-|*Renew actuator  |
|actuator (13).and|      |between pins C   |      |(13).            |
|check for 28V at |      |and A of actuator|      ------------------
|pin C.           |      ------------------
------------------               |
         |                       NO
         |                       |
         |               ------------------          ------------------
         NO              |Check for earth  |-NO--|Locate and       |
         |               |at pin A of cable|      |rectify          |
         |               |connector        |      ------------------
         |               ------------------
```

R Chart 102 (Sheet 1 of 2)

```
         |
------------------    ------------------
|Is relay (1) de- |-YES-|Ref Chart 105.   |
|energized. Check|    ------------------
|for 28V dc at    |
|test points      |
|UT1869/6 A & B on|
|panel 19-123.    |
------------------
         |
         NO
         |
------------------    ------------------
|Check continuity |-NO--|Locate and rect- |
|between terminal |     |ify O/C in wiring|
|6, relay (1) &   |     |between terminal |
|pin C actuator   |     |6 on relay(1) and|
|(13).            |     |pin (C) on plug  |
------------------      |(13).            |
         |              ------------------
        YES
         |
------------------    ------------------
|Check for 28V dc |-YES-|*Renew relay (1).|
|at terminal C on |    ------------------
|relay (1).       |
------------------
         |
         NO
         |
------------------
|Locate and rect- |
|ify O/C on cb(11)|
|or wiring.       |
------------------
```

R Chart 102 (Sheet 2 of 2)

```
***************************
* CIRCUIT BREAKER (10)    *
* ENGINE SHUT-DOWN        *
* RELAY TRIPPING          *
* A. NORMAL               *
* B. WITH HANDLE (18)     *
***************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO
POWER SUPPLIES 28V d.c.	-
MULTIMETER	-

CAUTION: 1. DO NOT OPERATE THE FIREFLAPS MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

2. THE ENGINE SHUT-DOWN HANDLE (18) IS ASSOCIATED WITH OTHER CIRCUITS (REF TABLE 101, PARA 7).

NOTE: Before renewal of components* check the wiring for continuity.

A. Normal

```
----------------------------------          -------------------------
|Check engine shut-down handle   |-YES-|Fault cleared.            |
|is set correctly. Does cb (10)  |      -------------------------
|reset?                          |
----------------------------------
                |
               NO
                |
----------------------------------          -------------------------
|Disconnect cable from terminal  |--NO-|*Renew cb (10).           |
|2 of cb (10),does cb (10)       |      -------------------------
|reset?                          |
----------------------------------
                |
               YES
                |
----------------------------------          -------------------------
|Check for stray voltage or      |--NO-|Renew engine shut-down|
|earth on cable from cb (10)     |      |handle.                   |
|to terminal 2.                  |      -------------------------
----------------------------------
                |
               YES
                |
----------------------------------
|Locate and rectify.             |
----------------------------------
```

R Chart 103 (Sheet 1 of 2)

B. With Handle (18) Pulled

```
 --------------------------------          ------------------------
|Reset handle (18) and check     |-YES-|Revert to procedure A |
|if cb (10) trips.               |     |Normal.               |
 --------------------------------          ------------------------
               |
               NO
               |
 --------------------------------          ------------------------
|With handle (18) pulled,        |-YES-|Locate and rectify    |
|check for stray voltage or      |     |wiring fault.         |
|earth at test point UT          |          ------------------------
|1869-6A on panel 19-123.        |
 --------------------------------
               |
               NO
               |
 --------------------------------          ------------------------
|Check for S/C across engine     |-YES-|*Renew relay (1).     |
|shut-down relay (1) coil        |          ------------------------
|terminals X and Z               |
 --------------------------------
               |
               NO
               |
 --------------------------------
|Fault cleared                   |
 --------------------------------
```

R Chart 103 (Sheet 2 of 2)

*CIRCUIT BREAKER(11) ENGINE BAY VENTILATION FLAP TRIPPING:
*A. NORMAL
*B. HANDLE (18) PULLED

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO
POWER SUPPLIES 28V dc	- -

NOTE: Before renewal of components* check wiring for continuity.

CAUTION: ENGINE SHUT-DOWN RELAY (1) IS ASSOCIATED WITH OTHER CIRCUITS (REF TABLE 101 PARA 7).

A. NORMAL

Open the engine bay door and disconnect plug to actuator (13) - is cb tripping?

-NO- *Renew actuator (13).

YES

Remove relay (1) - is cb tripping?

-NO- Check for cable fault of terminal 5 of relay (1). Is there a fault?

-NO- Renew relay(1)

YES

Locate & rectify wiring fault.

YES

Locate and rectify fault in wiring or cb (11).

R

Chart 104 (Sheet 1 of 2)

B. HANDLE (18) PULLED

```
-------------------      -------------------      -------------------
|Open engine bay  |--NO-|Check for short   |--NO-|Renew actuator    |
|doors and remove |      |to earth at pin   |      |(13).             |
|plug from actu-  |      |E of cable plug-  |      -------------------
|ator (13). Is    |      |is there a short?|
|cb tripping?     |      -------------------
-------------------               |
        |                        YES
        |                         |
        |                -------------------      -------------------
        |                |Unplug relay (2),|--NO-|Renew relay (2). |
        |                |check for short   |      -------------------
        |                |to earth at pin   |
        |                |E of cable plug.  |
       YES               |Is there a short?|
        |                -------------------
        |                         |
        |                        YES
        |                         |
        |                -------------------
        |                |Locate and recti-|
        |                |fy wiring fault.  |
        |                -------------------
        |
-------------------      -------------------      -------------------
|Unplug relay (1).|--NO-|Check for cable  |--NO-|Renew relay (1)).|
|Is cb tripping?  |      |fault at termin-  |      -------------------
-------------------      |al 6 of relay (1)|
        |                -------------------
       YES                       YES
        |                         |
-------------------      -------------------
|Locate and rec-  |      |Locate and rectify|
|tify fault in    |      |wiring fault.     |
|wiring or cb(11).|      -------------------
-------------------
```

R

Chart 104 (Sheet 2 of 2)

```
******************************
*ENGINE SHUT-DOWN            *
*RELAY (1) - DE-ENERGISED    *
*WITH HANDLE (18) PULLED     *
******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO
POWER SUPPLIES 28 V dc	-
MULTIMETER	-

CAUTION: ENGINE SHUT-DOWN HANDLE (18) IS ASSOCIATED WITH OTHER CIRCUITS (REF TABLE 101 PARA 7)

NOTE: Before renewal of components* check wiring for continuity.

```
------------------       ------------------       ------------------
|Reset engine      |--NO-|Check continuity |--NO-|Locate and        |
|shut-down handle  |     |between test     |     |rectify wiring    |
|(18). At test     |     |point UT1869-6B  |     |fault.            |
|point UT1869      |     |and relay (1)    |     ------------------
|panel 19-123      |     |terminal X.      |
|check continuity  |     ------------------
|between positions |             |
|6A and 6B.        |            YES
------------------               |
                          ------------------       ------------------
         |               |Check continuity |--NO-|Locate and -      |
         |               |between test     |     |rectify wiring    |
         |               |point UT1869-6A  |     |fault.            |
         |               |and relay (1)    |     ------------------
         |               |terminal Z.      |
        YES               ------------------
         |                       |
         |                      YES
         |                       |
         |                ------------------
         |               |Renew relay (1). |
         |                ------------------
------------------       ------------------       ------------------
|Pull handle (18).|--NO-|Check continuity |--NO-|Locate and        |
|Set cb(10).Check |     |between test     |     |rectify O/C.      |
|for 28V dc at    |     |point UT1869-6A  |     ------------------
|test point UT1869|     |and pin j plug   |
|-6A.             |     |1W160A.          |
------------------       ------------------
         |                       |
         |                      YES
```

R

Chart 105 (Sheet 1 of 2)

```
             |                          |
             |                  ------------------    ------------------
             |                  |Check for 28V dc |--NO-|Locate and       |
             |                  |at pin Y of plug |    |rectify fault in |
             |                  |1W160-A.         |    |wiring or cb (10)|
             |                  ------------------    ------------------
             |                          |
            YES                        YES
             |                          |
             |                  ------------------
             |                  |Renew E.S.D.H.   |
             |                  |(18).            |
             |                  ------------------
             |
 ------------------         ------------------
 |Check continuity |--NO-|Check continuity |--NO---------
 |to earth of test |     |between test     |            |
 |point UT1869-6B. |     |point UT1869-6B  |            |
 ------------------      |and pin d plug   |            |
             |           |1W160A.          |            |
             |           ------------------             |
             |                  |                       |
            YES                YES                      |
             |                  |                       |
 ------------------      ------------------    ------------------
 |Renew relay (1). |     |Check for earth  |--NO-|Locate and       |
 ------------------      |at pin F plug    |    |rectify O/C.     |
                         |1W160-A.         |    ------------------
                         ------------------
                                |
                               YES
                                |
                         ------------------
                         |Renew E.S.D.H.   |
                         |(18).            |
                         ------------------
```

R

Chart 105 (Sheet 2 of 2)

FIREFLAPS CAPTION (20) ILLUMINATED WITH ENGINE SHUT-DOWN HANDLE NORMAL

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLIES	
28V d.c.	-
MULTIMETER	-

NOTE: Before renewal of components * check wiring for continuity.

```
------------------
|Check flight deck|
|lights test swit-|
|ch on roof panel |
|is off.          |
------------------
         |
        YES
         |
------------------     ------------------
|Check engine     |-NO--|Reset handle (18)|
|shut-down handle |     ------------------
|(18) is fully in.|
------------------
         |
        YES
         |
------------------     ------------------
|Trip cbs (12)    |-NO--|Locate and recti-|
|(42) (72) (102)  |     |fy fault in      |
|- check caption  |     |lights test cir- |
|(20) (50) (80)   |     |cuit (Ref.       |
|(110) is out.    |     |33-14-00 T/S).   |
------------------     ------------------
         |
        YES
         |
------------------
|Set each cb in   |
|turn until the   |
|fault is iso-    |
|lated to a       |
|particular engine|
|bay which is here|
|assumed to be No1|
------------------
         |
```

R Chart 106 (Sheet 1 of 2)

```
       YES
        |
-------------------     -------------------     -------------------
|Check at test    |-NO--|With MI(5) show-  |-YES-|*Renew relay(2). |
|point UT1867/6C  |     |ing SHUT check    |     -------------------
|for 28V dc panel |     |for 28V at test   |
|19-123.          |     |point UT 1867-7A  |
-------------------     |panel 19-123.     |
        |               -------------------
       YES
        |
-------------------     -------------------     -------------------
|Check if engine  |-YES-|Check for 28V     |-YES-|*Renew engine    |
|bay ventilation  |     |across relay coil|     |shut-down handle |
|flap (29) is shut|     |(1) test point UT|     |(18).            |
-------------------     |1867-6A and 6B.  |     -------------------
        |               -------------------
        |                        |
        NO                       NO
        |                        |
-------------------     -------------------
|Locate and recti-|     |*Renew relay (1).|
|fy stray voltage |     -------------------
|on wire between  |
|engine bay       |
|ventilation flap |
|and relay (2).   |
-------------------
```

Chart 106 (Sheet 2 of 2)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
Engine No.1						
(1) Relay, engine shut-down (Ref)	123AB	19-123	1K232	Below flight compt.floor	71-31-00 R/I	71-31-01
(2) Relay, flap ind. control	123AB	19-123	1K234	Below flight compt.floor	71-31-00 R/I	71-31-01
(3) Relay, secondary door motor control	123AB	19-123	1K237	Below flight compt.floor	71-31-00 R/I	71-31-01
(4) Relay, flap ind. inhibit	123AB	19-123	1K244	Below flight compt.floor	71-31-00 R/I	71-31-01
(5) MI fire flap position	-	1-214	1K243	3CM station	71-31-00 R/I	71-31-01
(6) Diode	-	4-211	1K245	Pilots' roof panel	71-31-00 R/I	71-31-01
(7) Circuit breaker sec. door motor supply	-	2-213	1K247	Map ref C10	71-31-00 R/I	71-31-01
(8) Control switch sec. door	-	1-214	1K248	3CM station	71-31-00 R/I	71-31-01
(9) Motor, sec. door	411NB	-	1K250	Intake, rear of spill door	71-31-14 R/I.A/T	71-31-01
(10) Circuit breaker, 1A engine shut-down relay	-	3-213	1K253	Map ref F3	71-31-00 R/I	71-31-01
(11) Circuit breaker 5A						

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
engine bay vent flap	-	3-213	1K231	Map ref F1	71-31-00 R/I	71-31-01
(12) Circuit breaker 3A fireflap posn.	-	1-213	1K238	Map ref F2	71-31-00 R/I	71-31-01
(13) Actuator, engine bay vent flap	fwd eng bay door	415	1K233	Forward engine bay	71-31-11 R/I	71-31-01
(14) Diode	-	4-211	1K2315	Pilots'roof panel	71-31-00 R/I	71-31-01
(15) Indication switch unit	411NB	-	1K257	Intake, rear of spill door	71-31-16 R/I, A/T	71-31-01
(16) Relay ADC slave	123AZ	11-123	K258	Below flight compt.floor	71-31-00 R/I	71-31-01
(17) Relay, landing gear downlock (Ref)	123AZ	3-123	G372	Hyd. relay box	32-61-00	-
(18) Engine shut-down handle (ref)	-	4-211	1W160	Pilots' roof panel	26-22-00 R/I	-
(19) Circuit breaker 3A sec. air door cont.	-	15-215	K236	Map ref D17	71-31-00 R/I	71-31-01
(20) Caption fireflaps	-	4-211	K246	Pilots' roof panel	71-31-00 R/I	71-31-01
(21) ADC No.1 (Ref)	-	6-215	1F71	LH racking	34-11-41	-
(22) Switch ADC (Ref)	-	9-211	-	Centre console	34-11-41	-

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(23) Flexible drive shaft assy.	411NB	-	-	Fwd fire-proof bulkhead	71-31-13 R/I	-
(24) Jack, fireflap actuator	Engine bay door	-	-	Fwd of sec. air door	71-31-15 R/I, A/T	-
(25) Flap No. 1 (Sec. air door)	Engine bay door	-	-	Fwd fire-proof bulkhead	71-31-12 R/I, A/T	-
(26) Flap No. 9 (Sec. air door)	Engine bay door	-	-	Fwd fire-proof bulkhead	71-31-12 R/I, A/T	-
(27) Flap No. 11 (Sec. air door)	Engine bay door	-	-	Fwd fire-proof bulkhead	71-31-12 R/I, A/T	-
(28) Flap No. (Sec.air door)	Engine bay door	-	-	Fwd fire-eng. bay bulkhead	71-31-12 R/I,A/T	-
(29) Engine bay vent flap	Forward eng. bay door	-	-	Forward eng. bay door	71-31-11 R/I, A/T	-
(30)Shot 1 push-switch	-	4-211	1W67	Pilots' roof panel	26-10-00 R/I	26-21-01
(30a)Shot 2 push-switch	-	4-211	1W68	Pilots' roof panel	26-10-00 R/I	26-21-01
Engine No.2						
(31) Relay, engine shut-down (Ref)	123AB	19-123	2K232	Below flight compt.floor	71-31-00 R/I	71-31-02
(32) Relay, flap ind. control	123AB	19-123	2K234	Below flight compt.floor	71-31-00 R/I	71-31-02
(33) Relay,				Below	71-31-00	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
sec. door motor control	123AB	19-123	2K237	flight compt.floor	R/I	71-31-02
(34) Relay, flap ind. inhibit	123AB	19-123	2K244	Below flight compt.floor	71-31-00 R/I	71-31-02
(35) MI fire flap position	-	1-214	2K243	3CM station	71-31-00 R/I	71-31-02
(36) Diode	-	4-211	2K245	Pilots' roof panel	71-31-00 R/I	71-31-02
(37) Circuit breaker sec. door motor control	-	2-213	2K247	Map ref F10	71-31-00 R/I	71-31-02
(38) Control switch sec. door	-	1-214	2K248	3CM station	71-31-00 R/I	71-31-02
(39) Motor, sec. air door	421NB	421	2K250	Intake, rear of spill door	71-31-14 R/I, A/T	71-31-02
(40) Circuit breaker 1A engine shut-down relay	-	1-213	2K253	Map ref D1	71-31-00 R/I	71-31-02
(41) Circuit breaker 5A engine bay vent flap	-	1-213	2K231	Map ref D3	71-31-00 R/I	71-31-02
(42) Circuit breaker 3A fireflap position	-	5-213	2K238	Map ref C3	71-31-00 R/I	71-31-02
(43) Actuator, engine bay vent flap	Fwd eng bay door	426	2K233	Forward engine bay	71-31-11 R/I	71-31-02

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(44) Diode	-	4-211	2K2315	Pilots' roof panel	71-31-00 R/I	71-31-02
(45) Indication switch unit	421NB	421	2K257	Intake, rear of spill door	71-31-16 R/I, A/T	-
(46) Relay, ADC slave	123AZ	11-123	K259	Below flight compt.floor	71-31-00 R/I	-
(47) Relay, landing gear downlock	123AZ	3-123	G373	RH hydraulic relay box	32-61-00	-
(48) Engine shut-down handle (Ref)	-	4-211	2W160	Pilots' roof panel	26-22-00	-
(49) Circuit breaker 3A sec air door cont.	-	15-216	K252	Map ref B11	71-31-00 R/I	-
(50) Caption fireflaps	-	4-211	K246	Pilots roof panel	71-31-00 R/I	71-31-02
(51) ADC No.2 (Ref)	-	6-216	2F71	RH Racking	34-11-41 R/I	-
(52) Switch ADC (Ref)	-	9-211	-	Centre console	34-11-41 R/I	=
(53) Flexible drive shaft assy	421NB	-	-	Fwd. fireproof bulkhead	71-31-13 R/I	-
(54) Jack, fire-flap actuator	Engine bay door	-	-	Fwd.of sec. air door	71-31-15 R/I, A/T	71-31-02
(55) Flap No. 5 (Sec. air door)	Engine bay door	-	-	Fwd. fireproof bulkhead	71-31-12 R/I, A/T	-

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(56) Flap No. 13 (Sec. air door)	Engine bay door	-	-	Fwd. fire-proof bulkhead	71-31-12 R/I, A/T	-
(57) Flap No. 15 (Sec. air door)	Engine bay door	-	-	Fwd. Fire-proof bulkhead	71-31-12 R/I, A/T	-
(58) Flap No. 7 (Sec. air door)	Engine bay door	-	-	Fwd. fire-proof bulkhead	71-31-12 R/I, A/T	-
(59) Engine bay vent flap	Forward eng. bay door	-	-	Forward eng. bay door.	71-31-11 R/I, A/T	71-31-02
(60) Shot 1 push-switch	-	4-211	2W67	Pilots' roof panel	26-10-00 R/F	26-21-02
(60a)Shot 2 push-switch	-	4-211	2W68	Pilots' roof panel	26-10-00 R/F	26-21-02
Engine No.3						
(61) Relay, engine shut-down (Ref)	123AB	20-123	3K232	Below flight compt.floor	71-31-00 R/I	71-31-03
(62) Relay, flap ind. control	123AB	20-123	3K234	Below flight compt.floor	71-31-00 R/I	71-31-03
(63) Relay, secondary door motor control	123AB	20-123	3K237	Below flight compt.floor	71-31-00 R/I	71-31-03
(64) Relay, flap ind. inhibit	123AB	20-123	3K244	Below flight compt.floor	71-31-00 R/I	71-31-03
(65) MI fire flap position	-	1-214	3K243	3CM station	71-31-00 R/I	71-31-03
(66) Diode	-	4-211	3K245	Pilots'	71-31-00	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
				roof panel	R/I	71-31-03
(67) Circuit breaker sec. door motor control	-	4-213	3K247	Map ref A19	71-31-00 R/I	71-31-03
(68) Control switch sec. door	-	1-214	3K248	3CM station	71-31-00 R/I	71-31-03
(69) Motor, sec. air door	431NB	431	3K250	Intake, rear of spill door	71-31-14 R/I, A/T	71-31-03
(70) Circuit breaker 1A engine shut-down relay	-	1-213	3K253	Map ref D2	71-31-00 R/I, A/T	71-31-03
(71) Circuit breaker 5A engine bay vent flap	-	1-213	3K231	Map ref D4	71-31-00 R/I	71-31-03
(72) Circuit breaker 3A fire flap position	-	5-213	3K238	Map ref C4	71-31-00 R/I	71-31-03
(73) Actuator, engine bay vent flap	fwd. eng. bay door	435	3K233	Forward eng. bay door	71-31-11 R/I	71-31-03
(74) Diode	-	4-211	3K2315	Pilots' roof panel	71-31-00 R/I	71-31-03
(75) Indi-cation switch unit	431NB	431	3K257	Intake, rear of spill door	71-31-16 R/I, A/T	71-31-03
(76) Relay, ADC slave	123AZ	11-123	K259	Below flight compt.floor	71-31-00 R/I, A/T	71-31-03

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(77) Relay, landing gear downlock (Ref)	123AZ	2-123	G328	LH hyd- raulic relay box	32-61-00	71-31-03
(78) Engine shut down handle	-	4-211	4W160	Pilots' roof panel	26-22-00 R/I	71-31-03
(79) Circuit breaker 3A sec. air door cont.	-	15-216	K252	Map ref B11	71-31-00	71-31-03
(80) Caption fireflaps	-	4-211	K246	Pilots' roof panel	71-31-00 R/I	71-31-03
(81) ADC No.2 (Ref)	-	6-216	2F71	RH racking	34-11-41	-
(82) Switch ADC (Ref)	-	9-211	-	Centre console	34-11-41	-
(83) Flexible drive shaft assy	431NB	-	-	Fwd. fire- proof bulkhead	71-31-13 R/I	71-31-03
(84) Jack, fireflap actuator	Engine bay door	-	-	Fwd. of sec. air door	71-31-15 R/I, A/T	71-31-03
(85) Flap No. 8 (Sec. air door)	Engine bay door	-	-	Fwd. fire- proof bulkhead	71-31-12 R/I, A/T	71-31-03
(86) Flap No. 16 (Sec. air door)	Engine bay door	-	-	Fwd. fire- proof bulkhead	71-31-11 R/I, A/T	71-31-03
(87) Flap No. 14 (Sec. air door)	Engine bay door	-	-	Fwd. fire- proof bulkhead	71-31-11 R/I, A/T	71-31-03
(88) Flap No. 6 (Sec. air	Engine bay	-	-	Fwd. fire- proof	71-31-11 RI, A/T	71-31-03

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
door)	door			bulkhead		
(89) Engine bay vent flap	Forward eng. bay door	-	-	Forward eng. bay door	71-31-11 R/I, A/T	71-31-03
(90)Shot 1 push switch (Ref)	-	4-211	3W67	Pilots' roof panel	26-10-00 R/F	26-21-03
(90a)Shot 2 push-switch (Ref)	-	4-211	3W68	Pilots' roof panel	26-10-00 R/F	26-21-03
Engine No.4						
(91) Relay, engine shutdown	123AB	20-123	4K232	Below flight compt.floor	71-31-00 R/I	71-31-04
(92) Relay, flap ind. control	123AB	20-123	4K234	Below flight compt.floor	71-31-00 R/I	71-31-04
(93) Relay, secondary door motor control	123AB	20-123	4K237	Below flight compt.floor	71-31-00 R/I	71-31-04
(94) Relay, flap ind. inhibit	123AB	20-123	4K244	Below flight compt.floor	71-31-00 R/I	71-31-04
(95) MI fire flap position	-	1-214	4K243	3CM position	71-31-00 R/I	71-31-04
(96) Diode	-	4-211	4K245	Pilots' roof panel	71-31-00 R/I	71-31-04
(97) Circuit breaker sec. door motor control	-	4-213	4K247	Map ref F19	71-31-00 R/I	71-31-04
(98) Control switch sec.	-	1-214	4K248	3CM station	71-31-00 R/I	71-31-04

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
door						
(99) Motor, sec. air door	441NB	441	4K250	Intake, rear of spill door	71-31-14 R/I, A/T	71-31-04
(100) Circuit breaker 1A engine shut-down relay	-	3-213	4K253	Map ref F4	71-31-00 R/I	71-31-04
(101) Circuit breaker 5A engine bay vent flap	-	3-213	4K231	Map ref F2	71-31-00 R/I	71-31-04
(102) Circuit breaker 3A fireflap position	-	1-213	4K238	Map ref F3	71-31-00 R/I	71-31-04
(103) Actuator, engine bay vent flap	Fwd. eng. bay door	446	4K233	Forward engine bay	71-31-11 R/I, A/T	71-31-04
(104) Diode	-	4-211	4K2315	Pilots' roof panel	71-31-00 R/I	71-31-04
(105) Indication switch unit	441NB	441	4K257	Intake, rear of spill door	71-31-16 R/I, A/T	71-31-04
(106) Relay, ADC slave	123AZ	11-123	K258	Below flight compt.floor	71-31-00 R/I	71-31-04
(107) Relay, landing gear downlock (Ref)	123AZ	2-123	G329	LH hydraulic relay box	32-61-00	71-31-04
(108) Engine shutdown handle	-	4-211	4W160	Pilots' roof panel	26-22-00	71-31-04

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(109) Circuit breaker 3A sec. air door cont.	-	15-215	K236	Map ref D17	71-31-00 R/I	71-31-04
(110) Caption fireflaps	-	4-211	K246	Pilots' roof panel	71-31-00 R/I	71-31-04
(111) ADC No.1 (Ref)	-	6-215	1F71	LH racking	34-11-41	-
(112) Switch ADC (Ref)	-	9-211	-	Centre console	34-11-41	-
(113) Flexible drive shaft assy.	441NB	-	-	Fwd. fire-proof bulkhead	71-31-13 R/I	71-31-04
(114) Jack, fireflap actuator	Engine bay door	-	-	Fwd. of sec. air door	71-31-15 R/I, A/T	71-31-04
(115) Flap No.4 (Sec. air door)	Engine bay door	-	-	Fwd. fire-proof bulkhead	71-31-12 R/I, A/T	71-31-04
(116) Flap No.12 (Sec. air door)	Engine bay door	-	-	Fwd. fire-proof bulkhead	71-31-12 R/I, A/T	71-31-04
(117) Flap No.10 (Sec. air door)	Engine bay door	-	-	Fwd. fire-proof bulkhead	71-31-12 R/I, A/T	71-31-04
(118) Flap No.2 (Sec. air door)	Engine bay door	-	-	Fwd. fire-proof bulkhead	71-31-12 R/I, A/T	71-31-04
(119) Engine bay vent flap	Forward eng. bay door	-	-	Forward eng. bay door	71-31-11 R/I, A/T	71-31-04
(120) Shot 1 push-switch (Ref)	-	4-211	4W67	Pilots' roof panel	26-10-00 R/F	26-21-04

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(120a)Shot 2 push-switch (Ref)	-	4-211	4W68	Pilots' roof panel	26-10-00 R/F	26-21-04
(122) Relay 220 Kt	123AB	11-123	K2351	Below flight compt floor	71-31-00	71-31-04
(123)Diode	123AB	11-123	K2350	Below flight compt floor	71-31-00	71-31-04

Component Identification
Table 101

ENGINE FUEL CONTROL - TROUBLE SHOOTING

CAUTION: DURING TROUBLE SHOOTING THE ENGINE MUST NOT BE PERMITTED TO RUN STEADILY BETWEEN DEBOW AND IDLE.

1. General

A. The engine fuel control system basically comprises an electric starter pump, first stage fuel pump, flow control unit, second stage fuel pump, distribution and dump valve, fuel heater and filter, engine fuel flowmeter and fuel cooled air cooler.

The first stage fuel pump is mechanically driven while the second stage fuel pump, which is attached to the flow control unit is driven by an air turbine and is only operational when higher fuel flows are required and ceases operation normally by 20000 feet (altitude). The throttle valve in the flow control unit is operated by the actuator gearbox (TV) which receives signals from the electrical control system.

B. The first stage of trouble shooting is to isolate the defect to either the hydromechanical fuel system or the electrical control system. The electrical control system is duplicated i.e. 'Main' and 'Altern' and if a defect is present on both lanes, it is most probable that the defect lies in the hydromechanical system.

Defects which can occur in the system and not covered by the trouble shooting charts are detailed subsequently.

C. Should the 'Start Pump' caption remain illuminated after completion of the starting cycle it is indicative of: a fuel pump motor relay is still energized and the pump is still running, contact is still made across terminals D1 and D2 of the fuel pump motor relay (pump will not be running): or there is a spurious 28V between terminal D1 of the fuel pump motor relay and terminal 2 of the 'Start Pump' caption.

D. Residual fire in the turbine, following engine shut-down, will occur if the dump valve does not open to dump the fuel from the burner gallery when the HP shut-off valve is selected 'SHUT'. this will most probably require renewal of the distribution and dump valve.

E. High manifold temperature can be caused by indication system, fuel recirculation, fuel heater system or flow control unit. The temperature indication system should always be investigated first. If the recirculation and fuel heating system are satisfactory, high fuel temperature can be caused by the second stage pump running continually due to a defect within the flow control/second stage pump control system and will necessitate renewal of the flow control unit. Refer to Chart 107.

F. Excessive fuel drainage from the distribution and dump valve with the engine static and aircraft feed pumps switched 'ON', may be caused by a defective engine start solenoid. This item can be changed as a line replacement unit. A defect within the flow control unit could also be the cause of the excessive drainage and would necessitate renewal of the flow control unit. Prior to taking any action, confirm that the leakage rate is above the maximum permissible limits (Refer to 71-00-24, Table 102).

G. Should a restriction in maximum rpm be accompanied by the fuel filter caption being illuminated, it is probably due to a restriction in fuel flow caused by a severely contaminated fuel filter element (the caption will probably extinguish when the engine is throttled back). If the correct operating drill is not carried out and more than one engine is affected it may be due to ice blockage of the filter.

H. Continual hot starts when the ignition system, electrical control and engine cranking speed are satisfactory, is most probably due to either the fuel pilot sprayer jets or the distribution and dump valve but could also be due to the flow control unit.

J. Should a delayed engine light-up be accompanied by excessive fuel drainage from the distribution and dump valve during the starting cycle, it could be due to sticking of the valve in the distribution and dump valve or a defect in the flow control unit.

K. Failure of rpm to respond satisfactorily to throttle lever movement when the electronic control system is satisfactory could be the result of the following defects:

Damage to LP or HP compressors. This can be confirmed by the use of optical inspection instruments.

Failure of the drive from the actuator gearbox to the throttle valve in the flow control unit. This defect would not be detected by changing from the 'Main' to 'Altern' control systems. The actuator gearbox can be renewed as a line replacement item but if it is not defective, the drive failure may be within the flow control unit.

An internal defect within the flow control unit (other than drive failure) which will necessitate renewal of the flow control unit.

LP shaft signal rigging to distribution and dump valve which has been either activated, or inadvertently tripped, can cause N_2 rundowns and/or running at an incorrectly low N_2.

L. If an engine fails to achieve idle rpm during acceleration from debow (no throttle fail) with the start pump operation normal and a throttle lane change has no effect, then provided that the aircraft fuel supply is satisfactory, the most likely cause is within the flow control unit.

M. Hydraulic fluid contamination of the engine fuel system can occur due to a failure of a hydraulic fluid/fuel heat exchanger matrix, this can be indicated by a white deposit coating the jet pipe and exhaust diffuser areas. It may cause abnormal behaviour during engine start, erratic acceleration and high EGT.

N. Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is detailed in table 101.

2. Preparation

A. Ensure that external electrical power supply is connected and switched on.

B. Consult Chart 101 and carry out the actions indicated to determine which of the Trouble Shooting Charts is applicable.

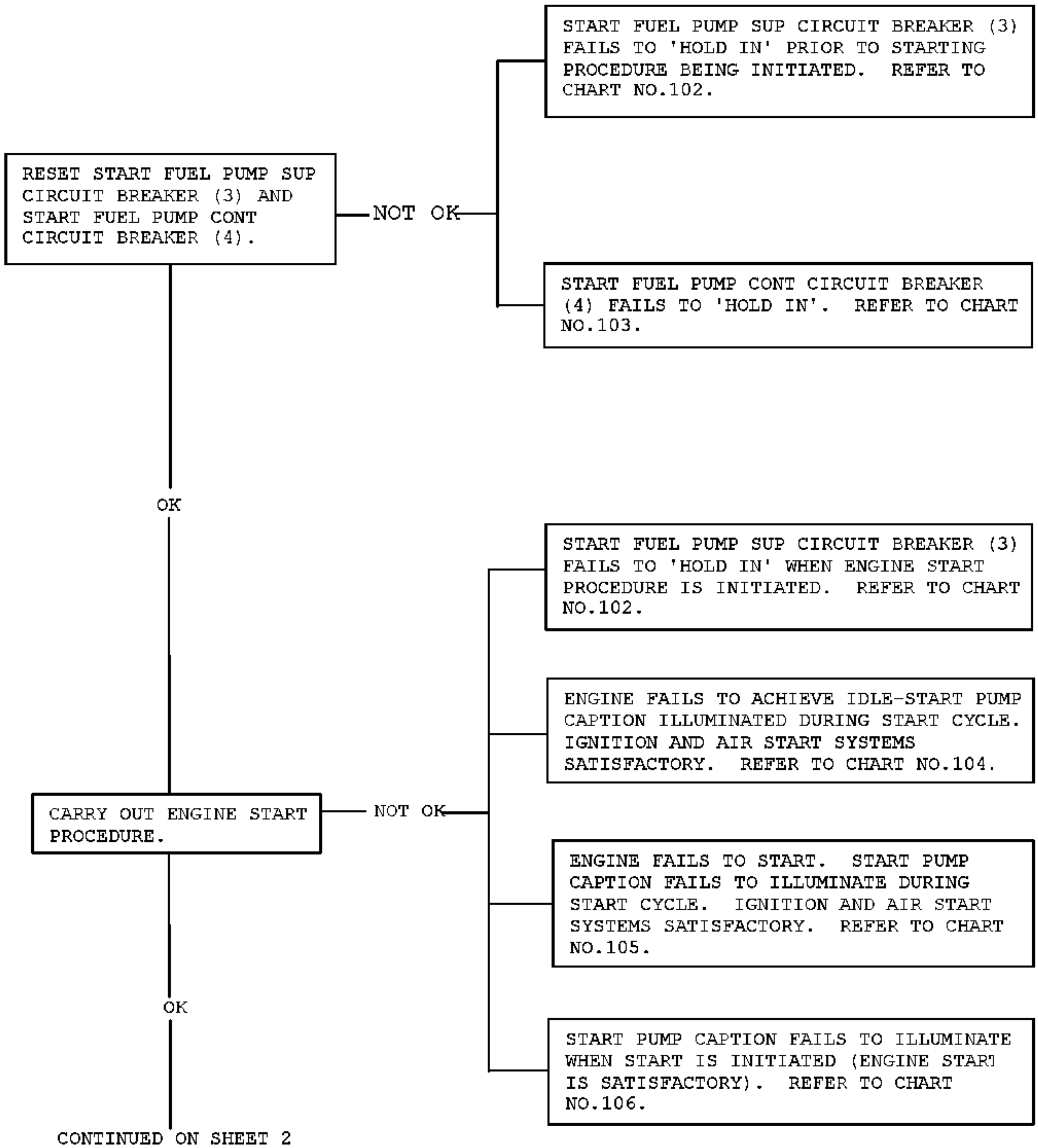

Chart 101 (Sheet 1 of 2)

CONTINUED FROM SHEET 1

ENGINE ACCELERATES AND STABILIZES AT IDLE.

NOT OK

HIGH FUEL TEMPERATURE (ATOMIZING NOZZLES). REFER TO CHART NO.107.

ENGINE LIGHTS UP BUT IS SLOW TO REACH IDLE rpm (DEFECT PRESENT WITH 'MAIN' OR 'ALTERN' CONTROL LANES SELECTED). REFER TO CHART NO.108.

OK

THE FOLLOWING MALFUNCTIONS MAY POSSIBLY OCCUR DURING GROUND RUN OR FLIGHT.

RESTRICTION OF MAXIMUM rpm EXHAUST GAS TEMPERATURE IN CORRECT RELATIONSHIP FOR rpm ACHIEVED. (DEFECT PRESENT WITH 'MAIN' OR 'ALTERN' CONTROL SELECTED). REFER TO 71-00-57 CHART NO.102.

RAPID DECELERATION FROM SELECTED rpm (POSSIBLE FLAME OUT). ENGINE FAILS TO REGAIN SELECTED rpm WITH 'MAIN' OR 'ALTERN' CONTROL SELECTED. REFER TO 71-00-57 CHART NO.106.

ENGINE FAILS TO SHUT DOWN WHEN HP VALVE CONTROL SWITCH IS SELECTED 'SHUT'. REFER TO CHART NO.109.

Chart 101 (Sheet 2 of 2)

NOTE: THE STARTER PUMP MOTOR CIRCUIT IS PROTECTED BY A 3 PHASE CIRCUIT BREAKER.

START FUEL PUMP SUP. CIRCUIT BREAKER (3) FAILS TO HOLD IN (A) WHEN ENGINE STARTING PROCEDURE IS INITIATED
(B) PRIOR TO STARTING PROCEDURE BEING INITIATED

RESET START FUEL PUMP SUP. CIRCUIT BREAKER (3). DOES CIRCUIT BREAKER HOLD IN?

YES →

NO ↓

DISCONNECT CABLES FROM TERMINAL 2 OF START FUEL PUMP SUP. CIRCUIT BREAKER (3). RESET CIRCUIT BREAKER. DOES CIRCUIT BREAKER HOLD IN?

NO → RENEW START FUEL PUMP SUP. CIRCUIT BREAKER (3).

YES ↓

RECONNECT CABLES TO CIRCUIT BREAKER (3). TRIP CIRCUIT BREAKER AND REMOVE FUEL PUMP MOTOR RELAY (9). IS THERE AN EARTH FAULT ON PIN A2, B2, OR C2 AT RELAY SOCKET?

YES → LOCATE AND RECTIFY EARTH FAULT BETWEEN FUEL PUMP MOTOR RELAY (9) SOCKET AND CIRCUIT BREAKER (3).

NO ↓

IS THERE A SHORT CIRCUIT BETWEEN FUEL PUMP MOTOR RELAY (9) SOCKET PINS
A2 AND B2
A2 AND C2
B2 AND C2

YES → LOCATE AND RECTIFY SHORT CIRCUIT BETWEEN FUEL PUMP MOTOR RELAY (9) SOCKET AND CIRCUIT BREAKER (3).

NO ↓

RENEW FUEL PUMP MOTOR RELAY (9). RESET CIRCUIT BREAKER (3). DOES CIRCUIT BREAKER HOLD IN?

NO → LOCATE AND RECTIFY SPURIOUS VOLTAGE ON LINE BETWEEN CIRCUIT BREAKER (3) AND FUEL PUMP MOTOR RELAY (9).

YES ↓

DEFECT RECTIFIED

Chart 102 (Sheet 1 of 2)

GROUND EQUIPMENT

DESCRIPTION

GROUND POWER SUPPLY (208V a.c.)
(115V a.c.)

MULTI=TEST METER

CIRCUIT BREAKER SAFETY CLIPS

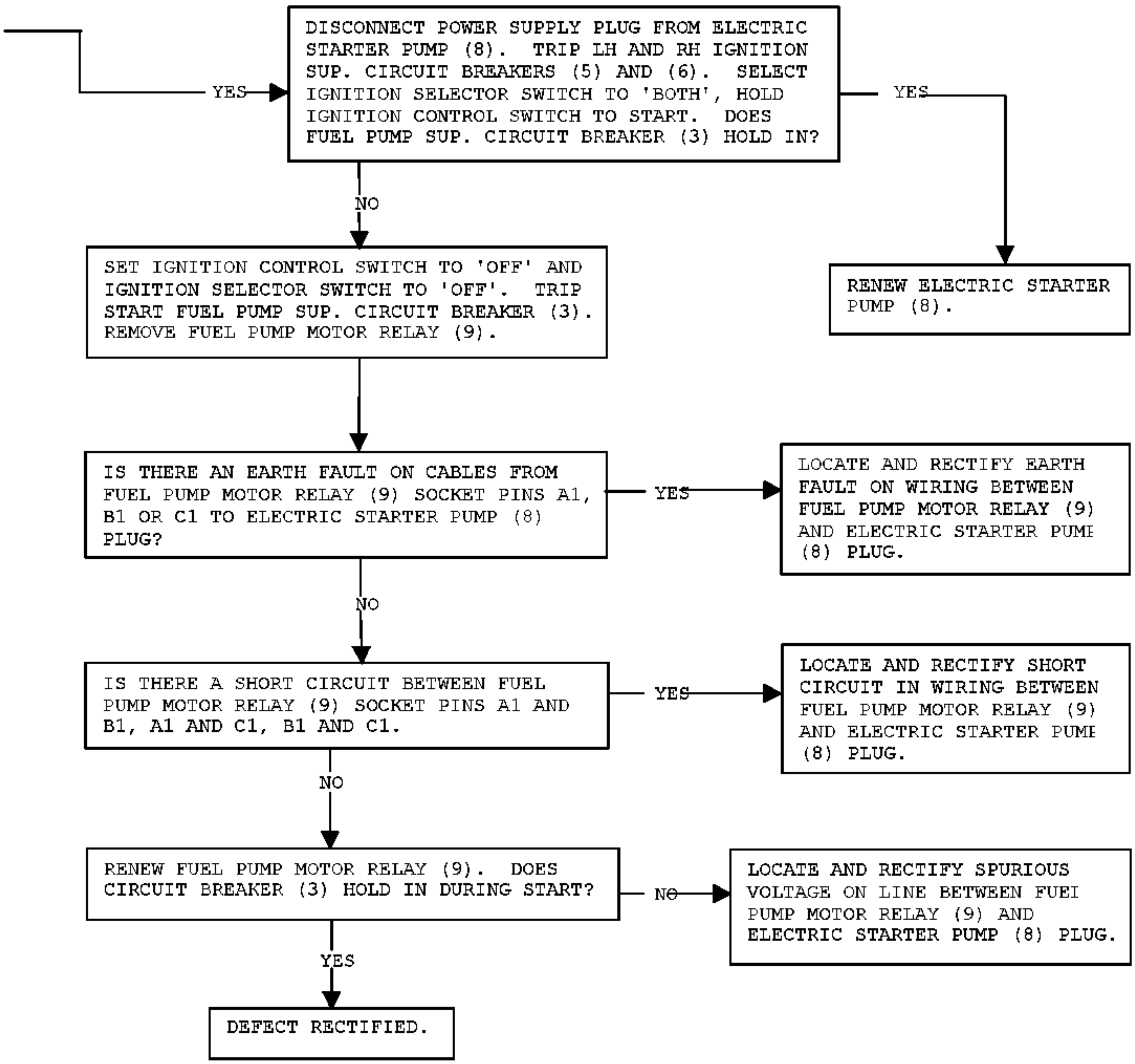

Chart 102 (Sheet 2 of 2)

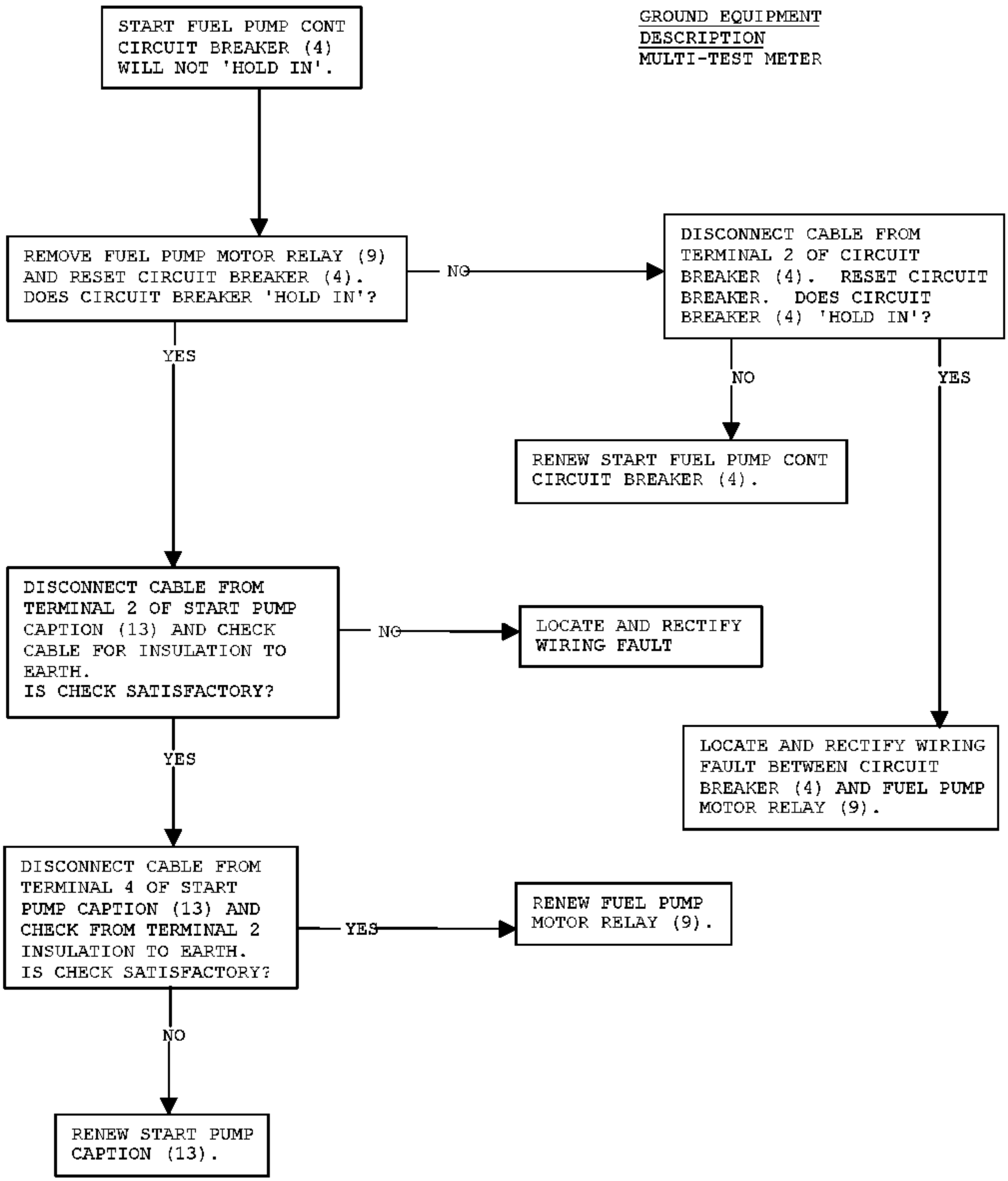

Chart 103

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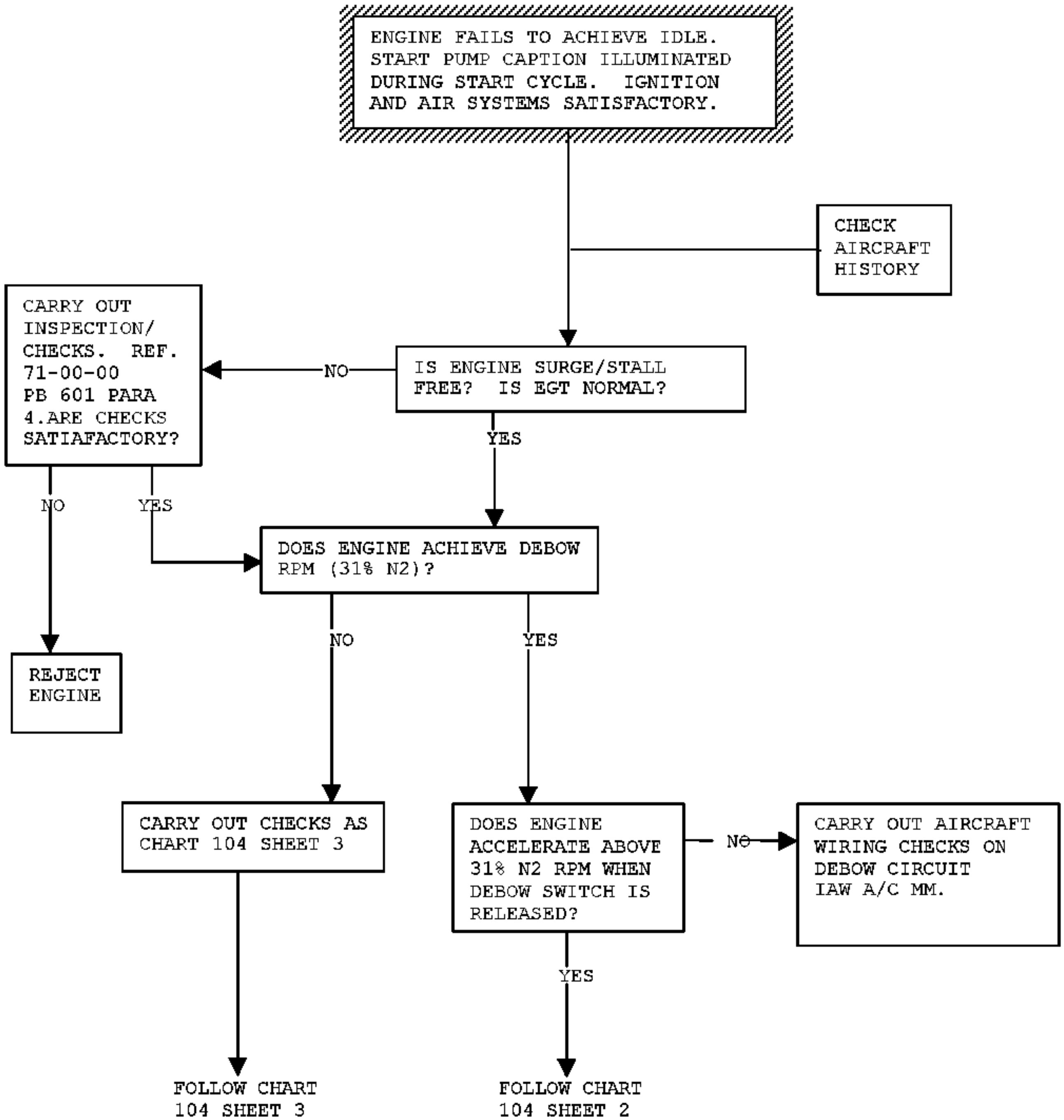
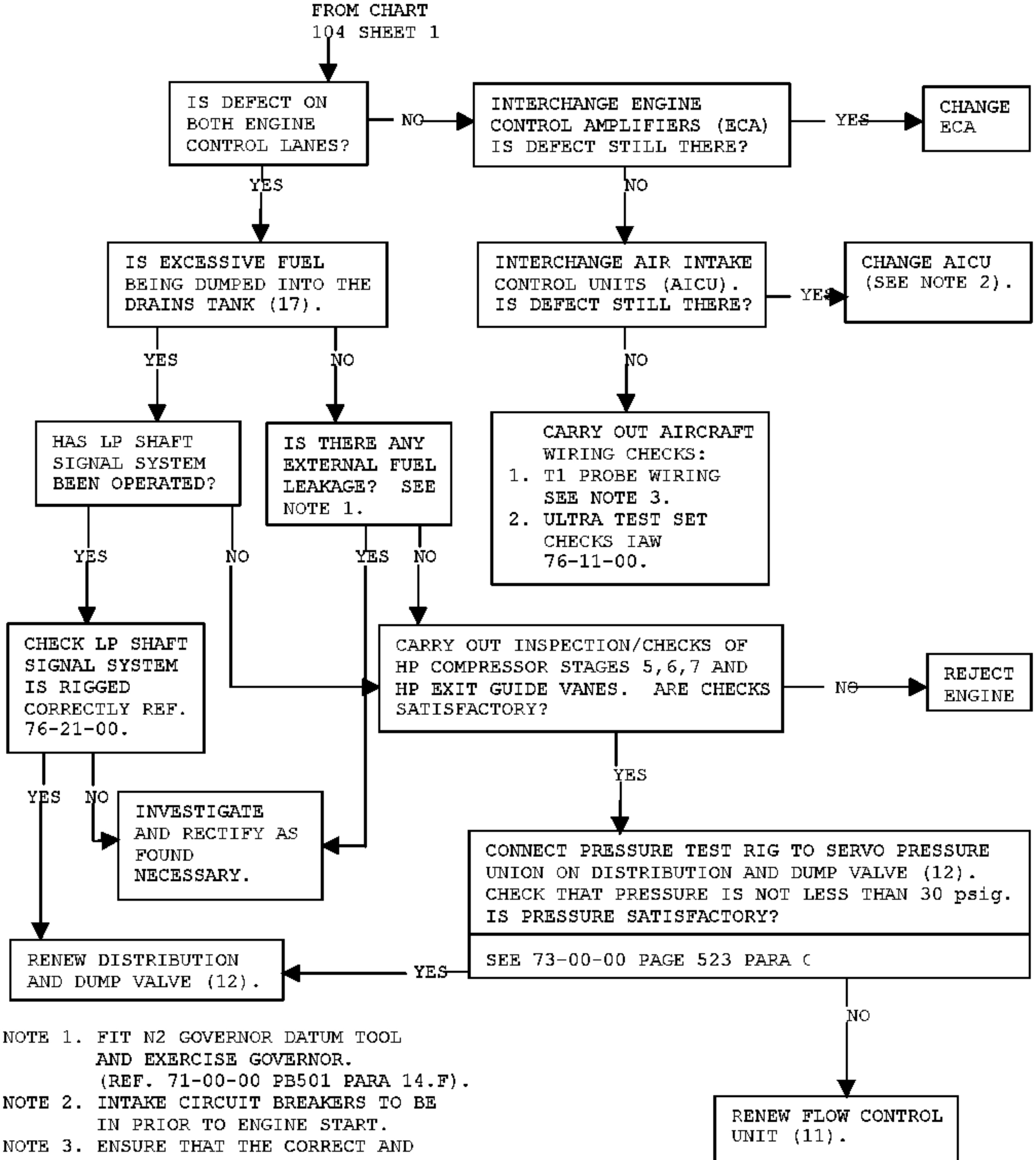


Chart 104 (Sheet 1 of 4)

CAUTION: THE ENGINE MUST NOT BE PERMITTED TO RUN STEADILY BETWEEN DEBOW AND IDLE.



NOTE 1. FIT N2 GOVERNOR DATUM TOOL AND EXERCISE GOVERNOR. (REF. 71-00-00 PB501 PARA 14.F).
NOTE 2. INTAKE CIRCUIT BREAKERS TO BE IN PRIOR TO ENGINE START.
NOTE 3. ENSURE THAT THE CORRECT AND APPROPRIATE T1 PROBE IS CHECKED FOR INTAKE CONTROL.

Chart 104 (Sheet 2 of 4)

<u>NOTE:</u> IT WILL BE NECESSARY TO MAKE THE SELECTIONS IN THE INITIAL BOX WHEN
B CHECKING THAT THE STARTER
B PUMP ROTATES.
B SUPPLY VOLTAGE AT STARTER PUMP PLUG.

FROM CHART 104 SHEET 1

TRIP LH IGNITION CONT. CIRCUIT BREAKER (1) AND RH IGNITION CONT. CIRCUIT BREAKER (2). SELECT AIRCRAFT FEED PUMPS 'ON', DEBOW. HP VALVE TO 'OPEN' AND ENGINE START SWITCH TO 'START'.

CARRY OUT AN AUDIO CHECK ON ELECTRIC STARTER PUMP (8). DOES CHECK CONFIRM THAT STARTER PUMP IS RUNNING SATISFACTORILY?

YES

NO

TRIP START FUEL PUMP SUP. CIRCUIT BREAKER (3). DISCONNECT POWER SUPPLY FROM STARTER PUMP AND RESET CIRCUIT BREAKER. IS THERE 208 V a.c. AT PINS 'A' TO 'B', 'B' TO 'C' AND 'C' TO 'A'?

YES — RENEW ELECTRIC STARTER PUMP (8).

NO

TRIP START FUEL PUMP SUP. CIRCUIT BREAKER (3). RENEW FUEL PUMP MOTOR RELAY (9). IS VOLTAGE NOW AVAILABLE AT PLUG TO STARTER PUMP (8)?

YES — TRIP CIRCUIT BREAKER (3) AND RECONNECT POWER SUPPLY PLUG TO ELECTRIC STARTER PUMP (8). CONFIRM THAT STARTER PUMP RUNS WHEN CHECK SEQUENCE IS INITIATED.

NO

TRIP START FUEL PUMP SUP. CIRCUIT BREAKER (3). REMOVE FUEL PUMP MOTOR RELAY (9) AND RESET CIRCUIT BREAKER. IS 208 V a.c. AVAILABLE AT RELAY SOCKET PINS A2 TO B2, B2 TO C2 AND C3 TO A2?

NO — LOCATE AND RECTIFY OPEN CIRCUIT ON WIRING BETWEEN CIRCUIT BREAKER (3) AND FUEL PUMP MOTOR RELAY (9). REFER TO WIRING DIAGRAM.

YES — LOCATE AND RECTIFY OPEN CIRCUIT BETWEEN FUEL PUMP MOTOR RELAY (9) AND PLUG TO STARTER PUMP (8). REFER TO WIRING DIAGRAM.

Chart 104 (Sheet 3 of 4)

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY 208V AC
28V DC

MULTI-TEST METER
PRESSURE TEST RIG-PE.

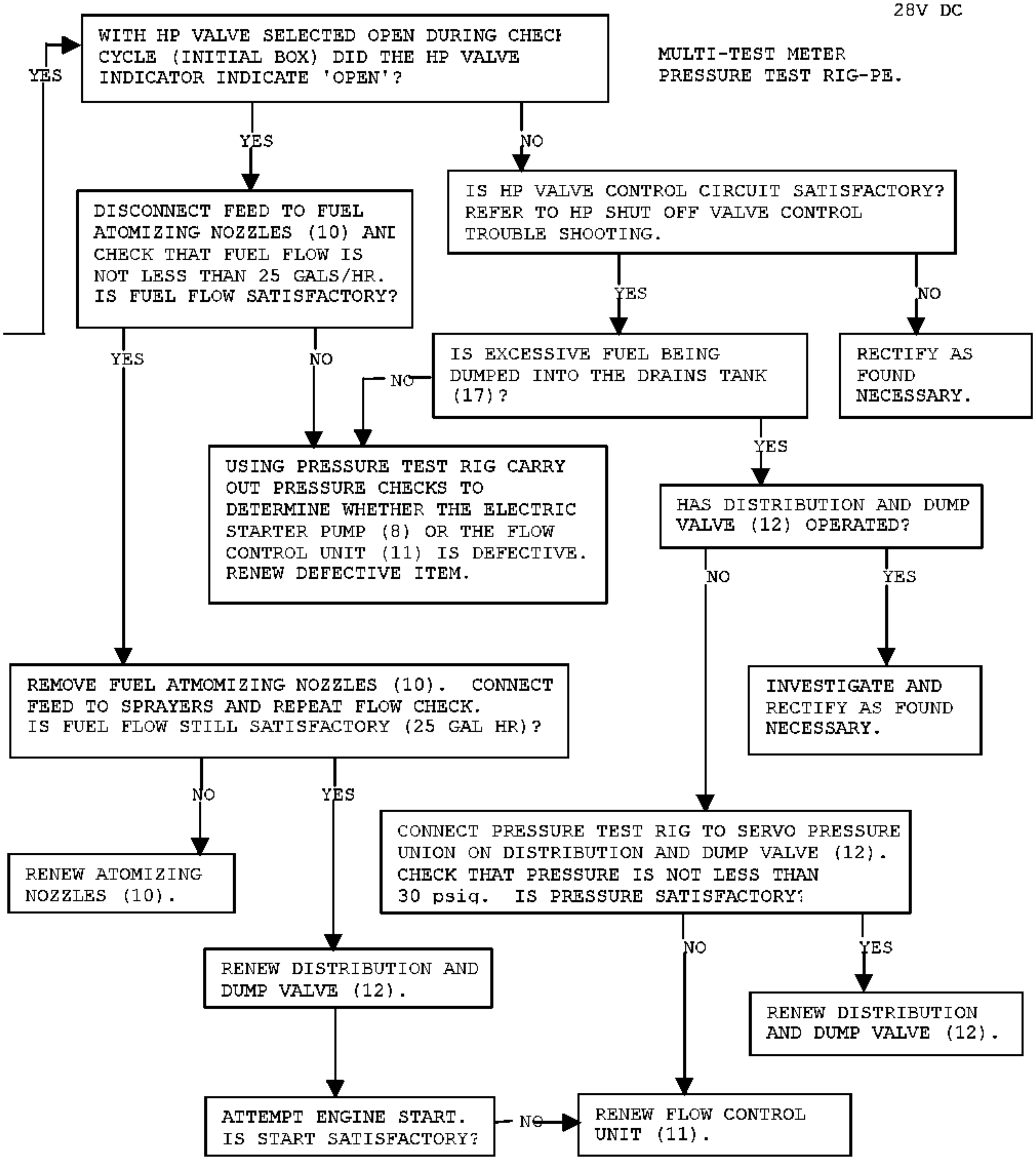


Chart 104 (Sheet 4 of 4)

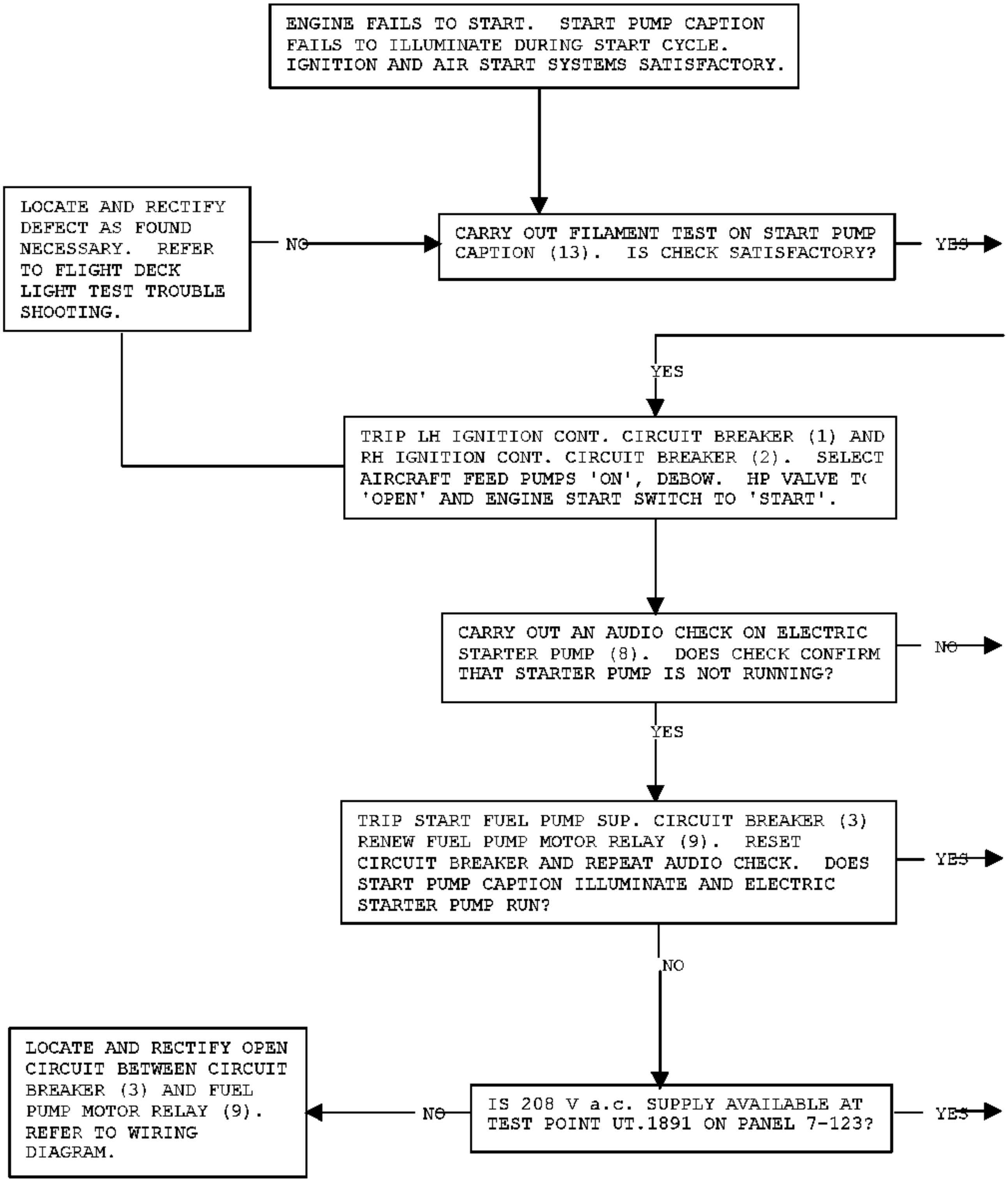


Chart 105 (Sheet 1 of 2)

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (208 V a.c AND 28 V d.c.)
CIRCUIT BREAKER SAFETY CLIPS
MULTI-TEST METER

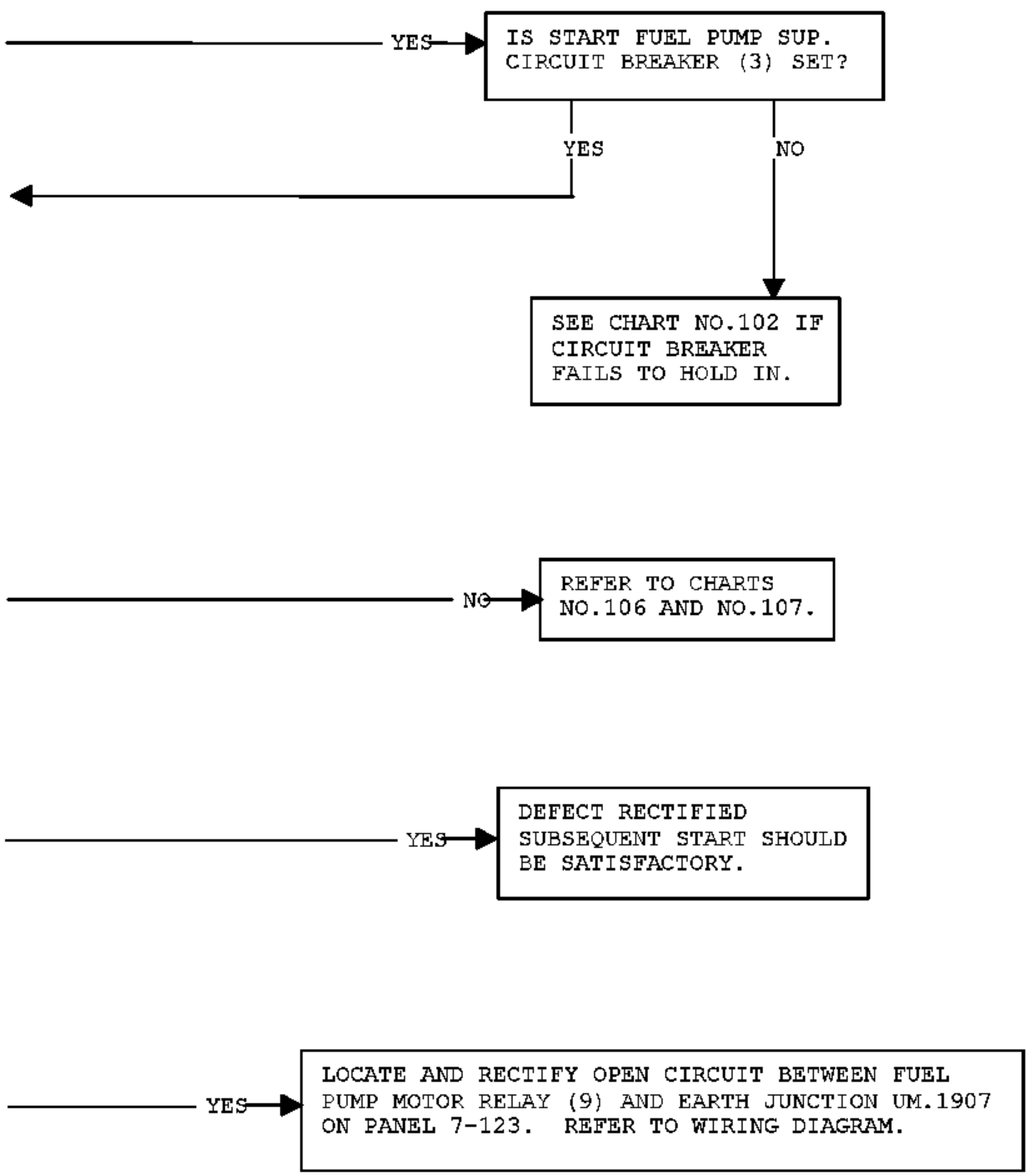


Chart 105 (Sheet 2 of 2)

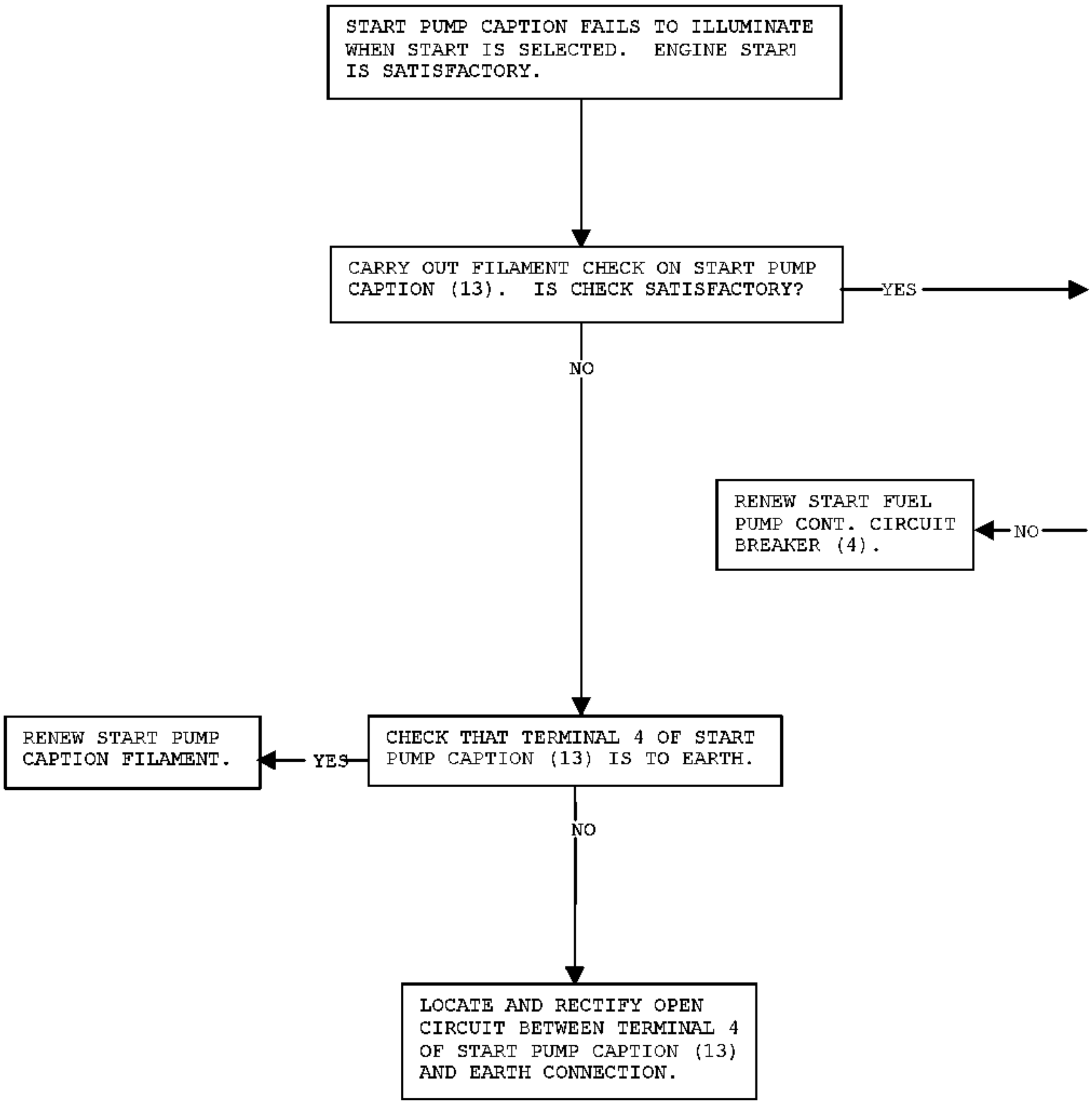
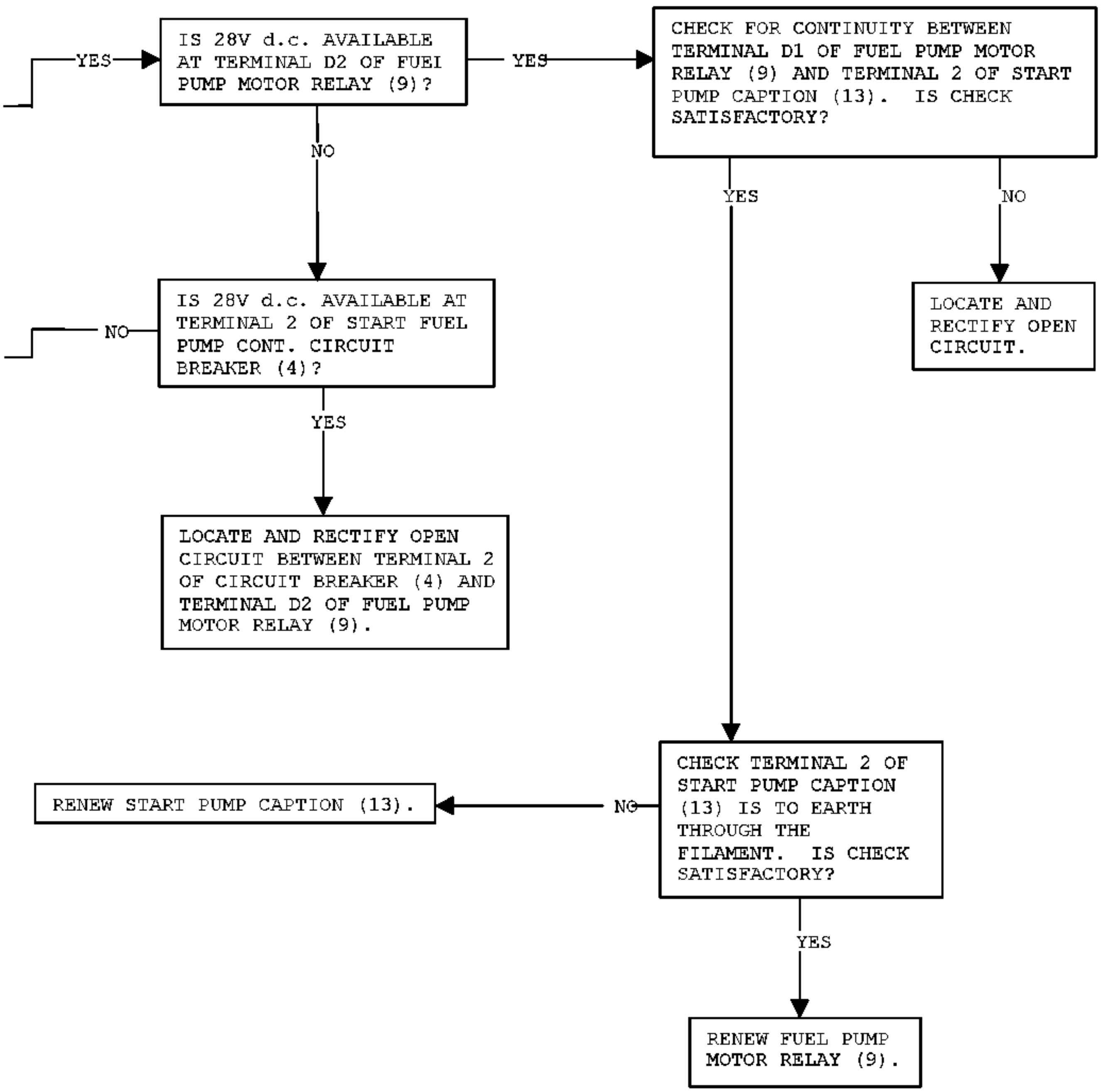


Chart 106 (Sheet 1 of 2)

GROUND EQUIPMENT
DESCRIPTION
MULTI-TEST METER
CIRCUIT BREAKER
SAFETY CLIPS



Chapter 106 (Sheet 2 of 2)

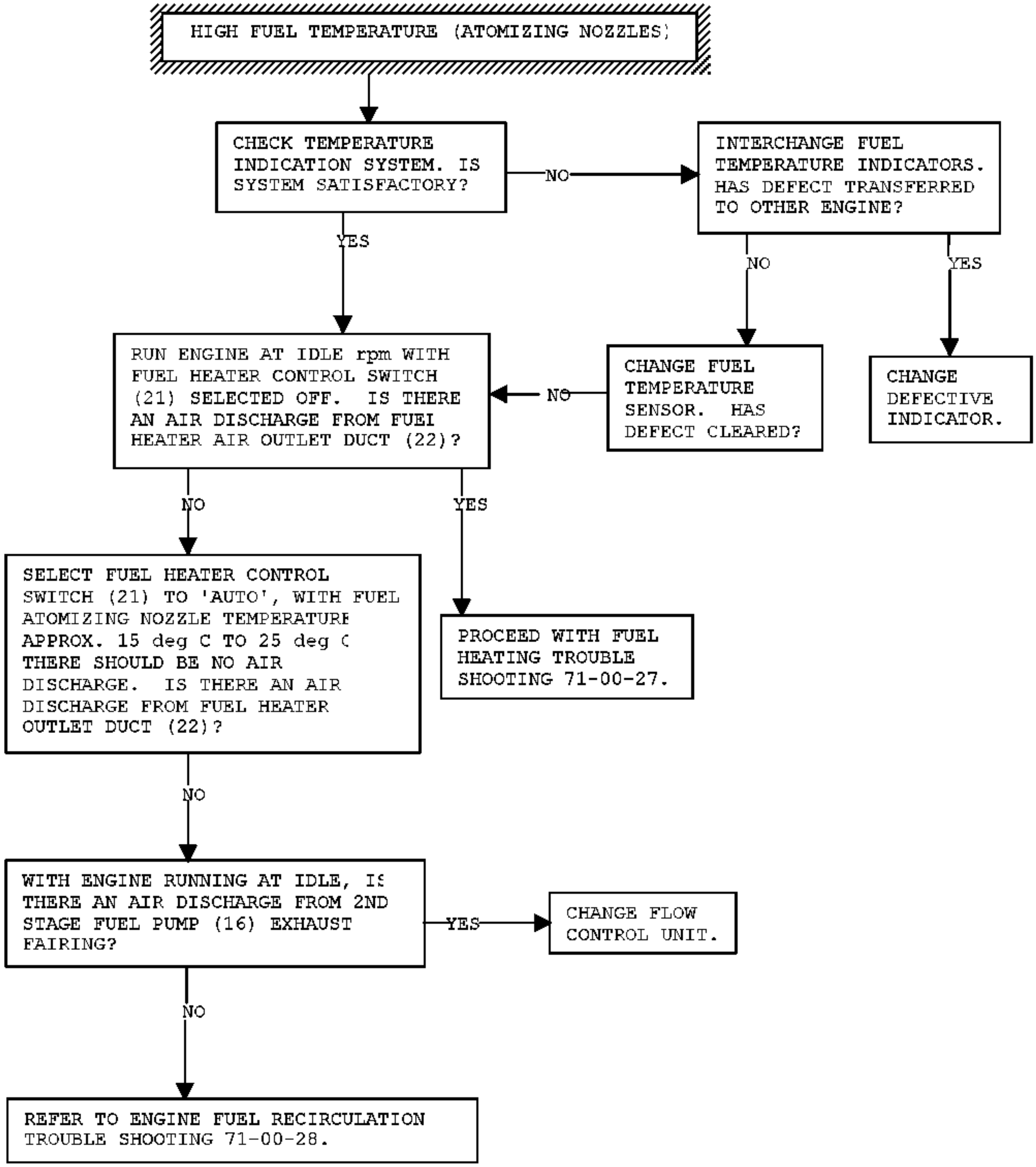

HIGH FUEL TEMPERATURE (ATOMIZING NOZZLES)
CHECK TEMPERATURE INDICATION SYSTEM. IS SYSTEM SATISFACTORY?
NO
INTERCHANGE FUEL TEMPERATURE INDICATORS. HAS DEFECT TRANSFERRED TO OTHER ENGINE?
YES
NO
YES
RUN ENGINE AT IDLE rpm WITH FUEL HEATER CONTROL SWITCH (21) SELECTED OFF. IS THERE AN AIR DISCHARGE FROM FUEL HEATER AIR OUTLET DUCT (22)?
NO
CHANGE FUEL TEMPERATURE SENSOR. HAS DEFECT CLEARED?
CHANGE DEFECTIVE INDICATOR.
NO
YES
SELECT FUEL HEATER CONTROL SWITCH (21) TO 'AUTO', WITH FUEL ATOMIZING NOZZLE TEMPERATURE APPROX. 15 deg C TO 25 deg C THERE SHOULD BE NO AIR DISCHARGE. IS THERE AN AIR DISCHARGE FROM FUEL HEATER OUTLET DUCT (22)?
PROCEED WITH FUEL HEATING TROUBLE SHOOTING 71-00-27.
NO
WITH ENGINE RUNNING AT IDLE, IS THERE AN AIR DISCHARGE FROM 2ND STAGE FUEL PUMP (16) EXHAUST FAIRING?
YES
CHANGE FLOW CONTROL UNIT.
NO
REFER TO ENGINE FUEL RECIRCULATION TROUBLE SHOOTING 71-00-28.

Chart 107

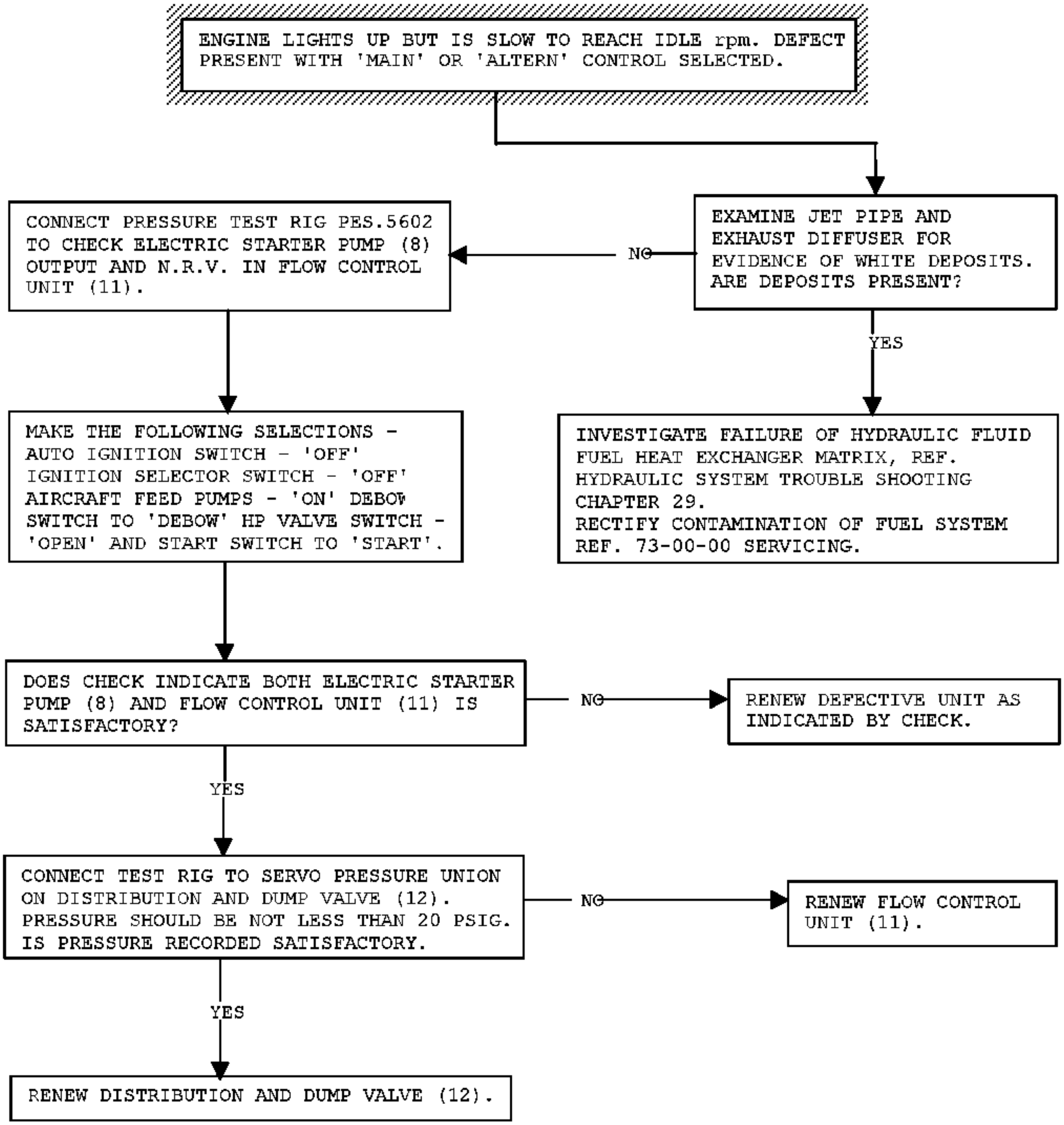

ENGINE LIGHTS UP BUT IS SLOW TO REACH IDLE rpm. DEFECT PRESENT WITH 'MAIN' OR 'ALTERN' CONTROL SELECTED.
EXAMINE JET PIPE AND EXHAUST DIFFUSER FOR EVIDENCE OF WHITE DEPOSITS. ARE DEPOSITS PRESENT?
NO
CONNECT PRESSURE TEST RIG PES.5602 TO CHECK ELECTRIC STARTER PUMP (8) OUTPUT AND N.R.V. IN FLOW CONTROL UNIT (11).
YES
INVESTIGATE FAILURE OF HYDRAULIC FLUID FUEL HEAT EXCHANGER MATRIX, REF. HYDRAULIC SYSTEM TROUBLE SHOOTING CHAPTER 29. RECTIFY CONTAMINATION OF FUEL SYSTEM REF. 73-00-00 SERVICING.
MAKE THE FOLLOWING SELECTIONS - AUTO IGNITION SWITCH - 'OFF' IGNITION SELECTOR SWITCH - 'OFF' AIRCRAFT FEED PUMPS - 'ON' DEBOW SWITCH TO 'DEBOW' HP VALVE SWITCH - 'OPEN' AND START SWITCH TO 'START'.
DOES CHECK INDICATE BOTH ELECTRIC STARTER PUMP (8) AND FLOW CONTROL UNIT (11) IS SATISFACTORY?
NO
RENEW DEFECTIVE UNIT AS INDICATED BY CHECK.
YES
CONNECT TEST RIG TO SERVO PRESSURE UNION ON DISTRIBUTION AND DUMP VALVE (12). PRESSURE SHOULD BE NOT LESS THAN 20 PSIG. IS PRESSURE RECORDED SATISFACTORY.
NO
RENEW FLOW CONTROL UNIT (11).
YES
RENEW DISTRIBUTION AND DUMP VALVE (12).

Chart 108

GROUND EQUIPMENT
DESCRIPTION
MULTI-TEST METER

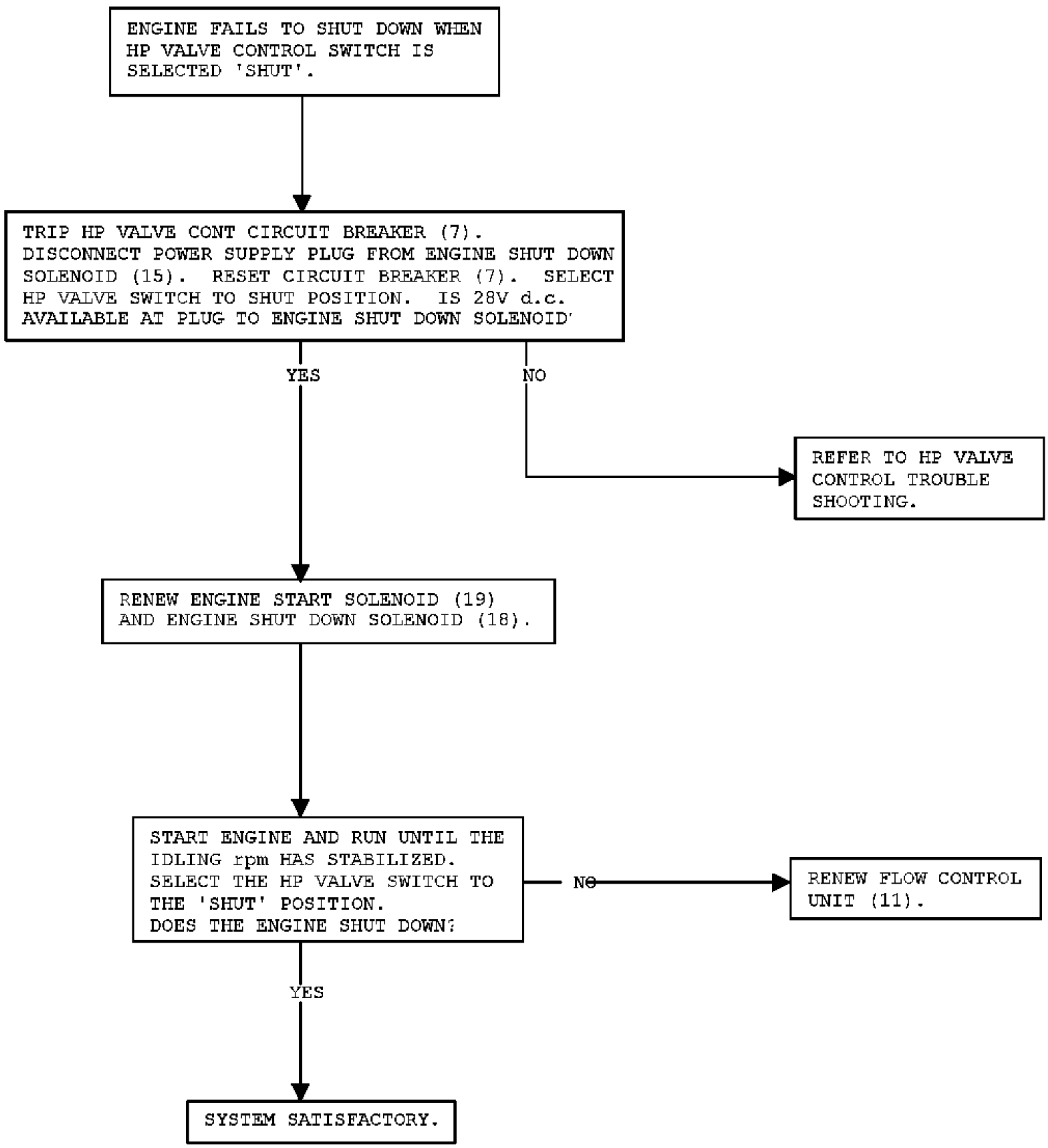


Chart 109

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ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
ENGINE NO.1						
(1) Circuit breaker 28 V	-	3-213	1J1	Map ref.E1		
(2) Circuit breaker 28 V	-	1-213	1J2	Map ref.N6		
(3) Circuit breaker 208 V	-	1-213	1Q812	Map ref.J6		
(4) Circuit breaker 28 V	-	5-213	1Q811	Map ref.D6		
(5) Circuit breaker 115 V	-	2-213	1J3	Map ref.G10		
(6) Circuit breaker 115 V	-	1-213	1J4	Map ref.N5		
(7) Circuit breaker 28 V	-	3-213	1K131	Map ref.C1		
(8) Electric starter pump	-	416	-	-	73-11-03	
(9) Fuel pump motor relay	-	7-123	1Q814	-	73-10-00	
(10) Fuel atomizing nozzles	-	416	-	-	73-12-07	
(11) Flow control unit	-	415	-	-	73-21-01	
(12) Distribution and dump valve	-	415	-	-	73-12-02	
(13) Start pump caption	-	1-214	1Q1352	-	73-10-00	
(14) Electro pressure control (LPC)	-	415	-	-	73-21-01	

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ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(15) First stage fuel pump	-	415	-	-	73-11-01	
(16) Second stage fuel pump	-	415	-	-	73-11-02	
(17) Drains tank	-	415/ 416	-	-	71-73-01	
(18) Engine shut down solenoid	-	415	-	-	73-21-01	
(19) Engine start solenoid	-	415	-	-	73-21-01	
(20) Fuel drain tube	-	415	-	-	71-73-05	
(21) Fuel heater control switch	-	1-214	1H1335	-	73-14-00	
(22) Fuel heater air outlet duct	-	415	-	-	75-03-00	
<u>ENGINE NO.2</u>						
(1) Circuit breaker 28 V	-	3-213	2J1	Map ref.E2		
(2) Circuit breaker 28 V	-	1-213	2J2	Map ref.P6		
(3) Circuit breaker 208 V	-	1-213	2Q812	Map ref.K6		
(4) Circuit breaker 28 V	-	1-213	2Q811	Map ref.G5		
(5) Circuit breaker 115 V	-	2-213	2J3	Map ref.B10		
(6) Circuit breaker 115 V	-	1-213	2J4	Map ref.P5		

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(7) Circuit breaker 28 V	-	1-213	2K131	Map ref.C3		
(8) Electric starter pump	-	426	-	-	73-11-03	
(9) Fuel pump motor relay	-	7-123	2Q814	-	73-10-00	
(10) Fuel atomizing nozzles	-	426	-	-	73-12-07	
(11) Flow control unit	-	425	-	-	73-21-01	
(12) Distribution and dump valve	-	425	-	-	73-12-02	
(13) Start pump caption	-	1-214	2Q1352	-	73-10-00	
(14) Electro pressure control (LPC)	-	425	-	-	73-21-01	
(15) First stage fuel pump	-	425	-	-	73-11-01	
(16) Second stage fuel pump	-	425	-	-	73-11-02	
(17) Drains tank	-	425/ 426	-	-	71-73-01	
(18) Engine shut down solenoid	-	425	-	-	73-21-01	
(19) Engine start solenoid	-	425	-	-	73-21-01	
(20) Fuel drain tube	-	425	-	-	71-73-05	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(21) Fuel heater control switch	-	1-214	2H1335	-	73-14-00	
(22) Fuel heater air outlet duct	-	425	-	-	75-03-00	
ENGINE NO.3						
(1) Circuit breaker 28 V	-	3-213	3J1	Map ref.E3		
(2) Circuit breaker 28 V	-	1-213	3J2	Map ref.Q6		
(3) Circuit breaker 208 V	-	1-213	3Q812	Map ref.L6		
(4) Circuit breaker 28 V	-	1-213	3Q811	Map ref.G6		
(5) Circuit breaker 115 V	-	2-213	3J3	Map ref.B11		
(6) Circuit breaker 115 V	-	1-213	3J4	Map ref.Q5		
(7) Circuit breaker 28 V	-	1-213	3K131	Map ref.C4		
(8) Electric starter pump	-	436	-	-	73-11-03	
(9) Fuel pump motor relay	-	8-123	3Q814	-	73-10-00	
(10) Fuel atmomizing nozzles	-	436	-	-	73-12-07	
(11) Flow control unit	-	435	-	-	73-21-01	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(12) Distribution and dump valve	-	435	-	-	73-12-01	
(13) Start pump caption	-	1-214	1Q1352	-	73-10-00	
(14) Electro pressure control (LPC)	-	435	-	-	73-21-01	
(15) First stage fuel pump	-	435	-	-	73-11-01	
(16) Second stage fuel pump	-	435	-	-	73-11-02	
(17) Drains tank	-	435/ 436	-	-	71-73-01	
(18) Engine shut down solenoid	-	435	-	-	73-21-01	
(19) Engine start solenoid	-	435	-	-	73-21-01	
(20) Fuel drain tube	-	435	-	-	71-73-05	
(21) Fuel heater control switch	-	1-214	3H1335	-	73-14-00	
(22) Fuel heater air outlet duct	-	435	-	-	75-03-00	
ENGINE NO.4						
(1) Circuit breaker 28 V	-	3-213	4J1	Map ref.E4		
(2) Circuit breaker 28 V	-	1-213	4J2	Map ref.R6		

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ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(3) Circuit breaker 208 V	-	1-213	4Q812	Map ref.M6		
(4) Circuit breaker 28 V	-	5-213	4Q811	Map ref.D4		
(5) Circuit breaker 115 V	-	2-213	4J3	Map ref.G11		
(6) Circuit breaker 115 V	-	1-213	4J4	Map ref.R5		
(7) Circuit breaker 28 V	-	3-213	4K131	Map ref.C2		
(8) Electric starter pump	-	446	-	-	73-11-03	
(9) Fuel pump motor relay	-	8-123	4Q814	-	73-10-00	
(10) Fuel atomizing nozzles	-	446	-	-	73-12-07	
(11) Flow control unit	-	445	-	-	73-21-01	
(12) Distribution and dump valve	-	445	-	-	73-12-02	
(13) Start pump caption	-	1-214	4Q1352	-	73-10-00	
(14) Electro pressure control (LPC)	-	445	-	-	73-21-01	
(15) First stage fuel pump	-	445	-	-	73-11-01	
(16) Second stage fuel pump	-	445	-	-	73-11-02	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(17) Drains tank	-	445/ 446	-	-	71-73-01	
(18) Engine shut down solenoid	-	445	-	-	73-21-01	
(19) Engine start solenoid	-	445	-	-	73-21-01	
(20) Fuel drain tube	-	445	-	-	71-73-05	
(21) Fuel heater control switch	-	1-214	4H1335	-	73-14-00	
(22) Fuel heater air outlet duct	-	445	-	-	75-03-00	

Component Identification
Table 101

FUEL HEATING - TROUBLE SHOOTING

1. General

A. The fuel heating system comprises a combined fuel heater and filter, air control valve and solenoid, selector switch, control unit and platinum wire resistance type thermometer. The illustration (Ref. Fig. 101) shows the relationship between temperature and resistance. Power is supplied from the main d.c. busbar via two circuit breakers for manual or automatic control of the system. When selected 'ON', the air control valve solenoid is energised via the 'FUEL HTR IND AND MANL CONT' circuit breaker, the air control valve opens, and hot air passes over the fuel heater matrix.

With 'AUTO' selected the air control valve solenoid is energised via the 'FUEL HTR AUTO' circuit breaker only when the fuel heater control unit reveives a signal from the fuel heater control thermometer that the fuel temperature is less than 5 deg C. The actual operating temperature will be a function of the overall resistance of aircraft wiring, tolerance of setting in the fuel heater control unit, and tolerance of error in the thermometer. The effect of these tolerances can result in the operating temperature varying from plus 5 deg C to 15 deg C.

B. To prevent rapid ON/OFF switching, a two and a half minute time delay is built into the automatic circuit, i.e. when the air control valve is opened automatically it will stay open for two and a half minutes after the fuel temperature has risen above plus 5 deg C. The circuit breakers supply a pair of engine. One set supplies engines No.1 and No.4 and the other set supplies No.2 and No.3 engines. This should be noted if an identical defect is reported on paired engines.

R C. A three position Test Switch, spring-loaded to the centre
R 'OFF' position, and an associated annunciator light, are
R situated on the front face of the fuel heater control unit.
R The test switch provides a means of proving that the
R control unit and complete system are functioning satisfac-
R torily. For the test switch to be used the annunciator
R light must be extinguished. The annunciator light is
R illuminated when the control unit is operational, i.e. when
R the fuel temperature is below 5 deg C. When testing is
R to be carried out under these conditions, the fuel temper-
R ature thermometer input plug should be disconnected, and a
R resistance of 150 ohms connected across pins A and B of
R the plug. This will ensure that the light is not illumin-

ated.

D. Failure of an air control valve in the open position will
R result in the fuel temperature (atomizing nozzles) being in the region of between 40 and 50 deg C higher than that on the other engines and will be consistently high throughout the flight.

E. The failure of a fuel recirculation valve to open will
R result in a high fuel temperature (atomizing nozzles) when the engine is throttled back at the end of supersonic cruise.

F. The Fuel Filter caption will illuminate should the pressure drop across the filter element reach 7 psig. The increased pressure drop may be due to either foreign matter or secretion of ice particles in the filter if the fuel inlet temperatures are low and the fuel heater is inoperative.

It should be noted that with all Fuel Heaters selected to Auto due to small variations in the system, they will not all commence to operate and switch off at precisely the same moment.

G. Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is detailed in Table 101.

2. Preparation

A. Ensure that external electrical power supply is connected and switched on.

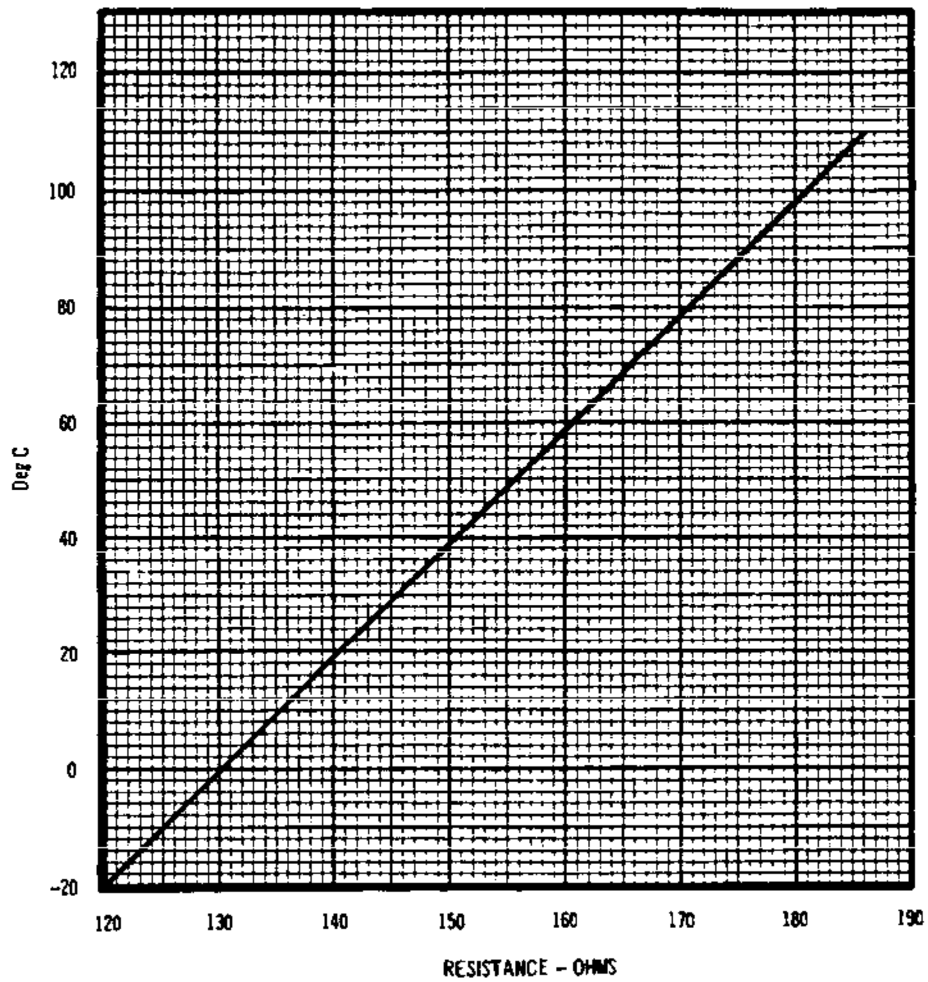
B. Consult Chart 101 and carry out actions indicated to determine which of the trouble shooting charts is applicable.

3. Fuel Heater Control Unit Test Procedure

A. When testing is to be carried out the "DOWN" position (position 2) of the switch should be selected first.

In this position the test light should come "ON" and remain "ON" for nominally two and a half minutes after the switch has been released to the centre "OFF" position.

Upon the successful completion of this test, the switch should be selected to the "DOWN" position again, such that the annunciator light is illuminated again. The switch should then be immediately selected to the "UP" position (position 1). In this position the light should extinguish.



CMR 71 OC27 1 AAMO

Temperature/Resistance Relationship
Figure 101

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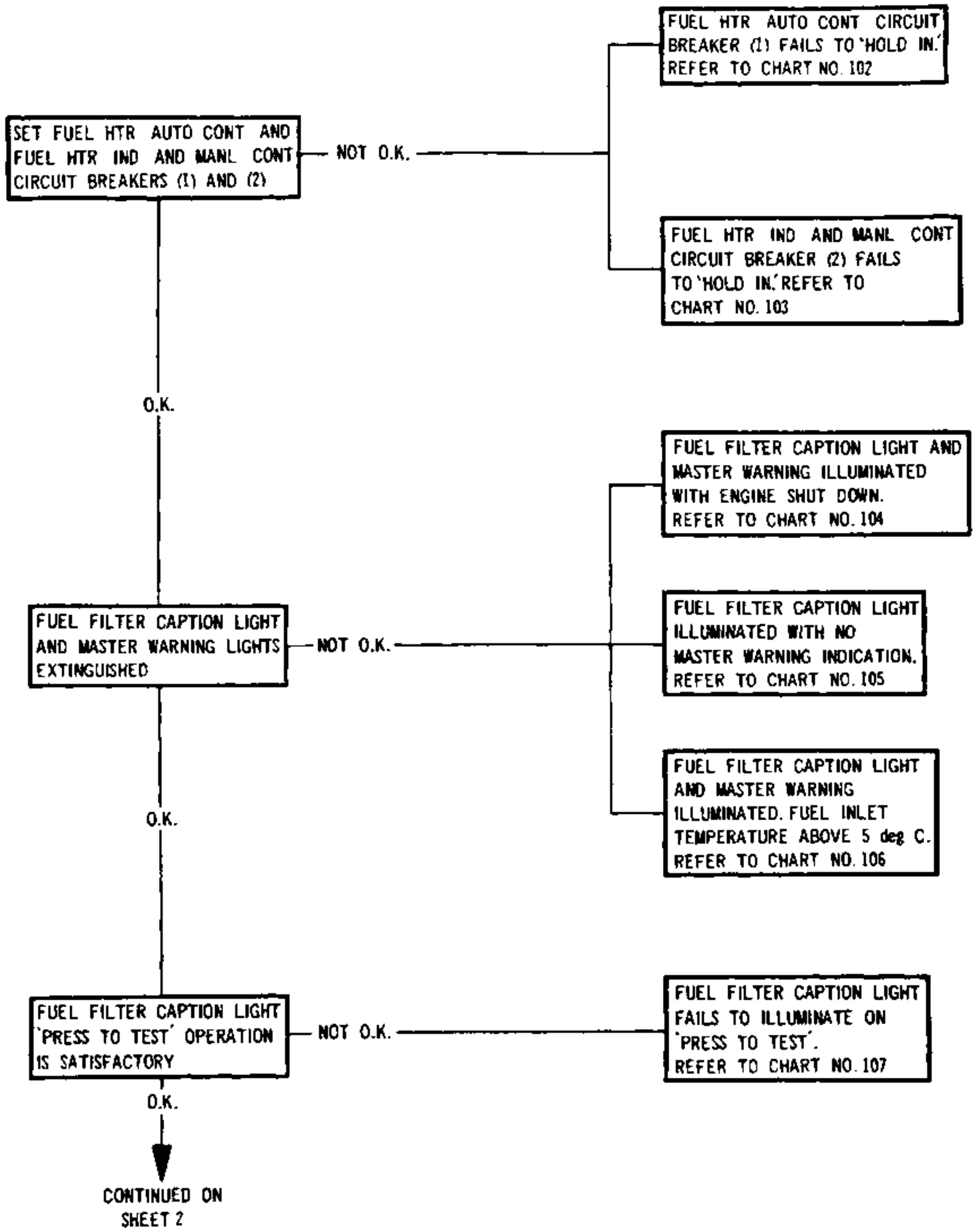
The condition of the control unit, the solenoid circuit, and the thermometer circuit is satisfactory when the switch is in the "DOWN" position and the annunciator light is illuminated.

If the light fails to illuminate with the switch in the "DOWN" position a fault can exist in:

solenoid circuit
thermometer circuit
annunciator light filament
failure detection circuit)
temperature datum) control unit
relay failure)

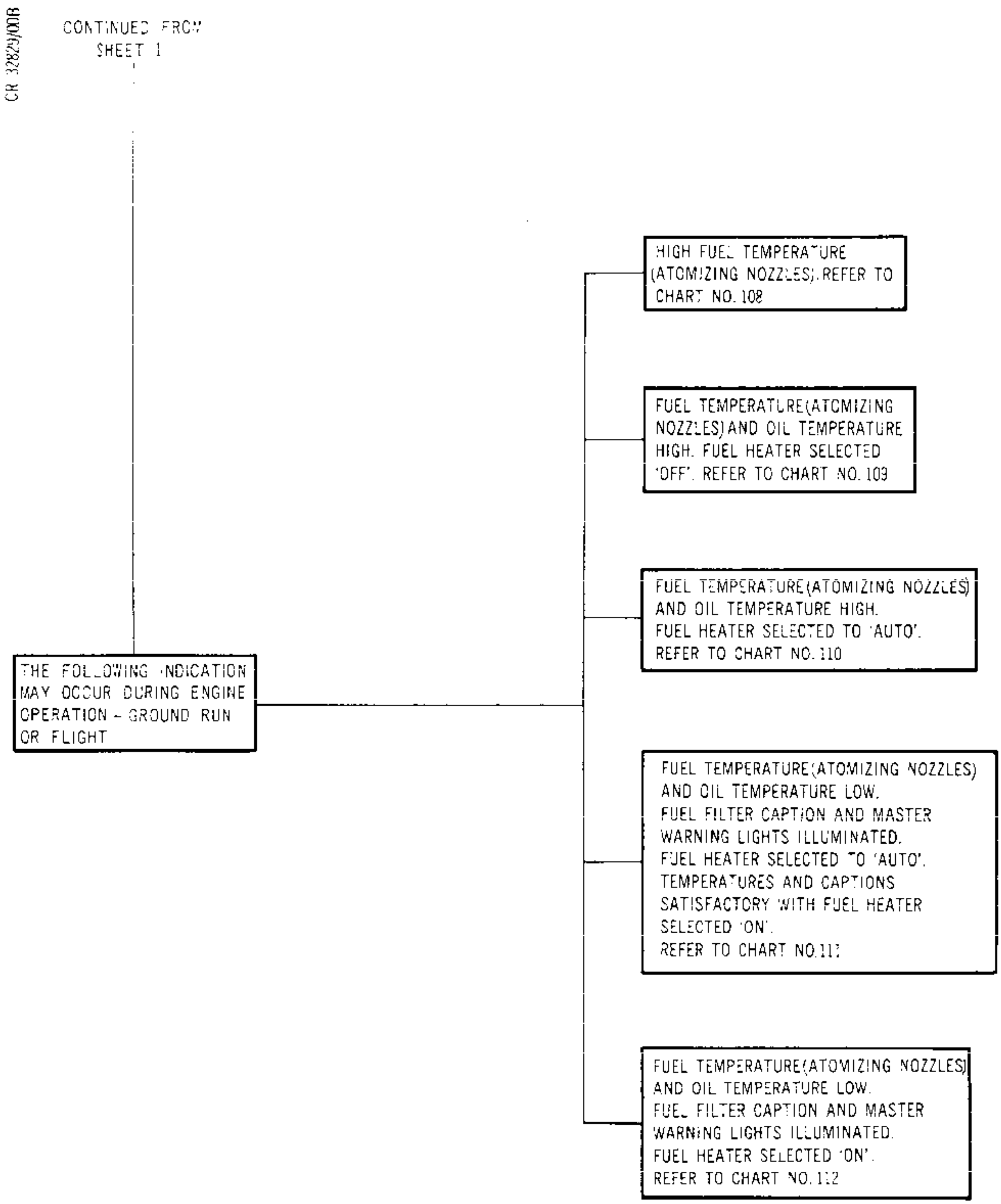
With the switch in the "UP" position, the triggering of the failure detection circuit is being proven when the light is extinguished. If the light remains illuminated, a fault condition exists within the failure detection circuit of the Control Unit.

With the switch in the "DOWN" position, if the test light remains illuminated after the nominal time of two and a half minutes failure condition exists within the timer circuit of the Control Unit.



CMR 71 00 27 1 BAMA

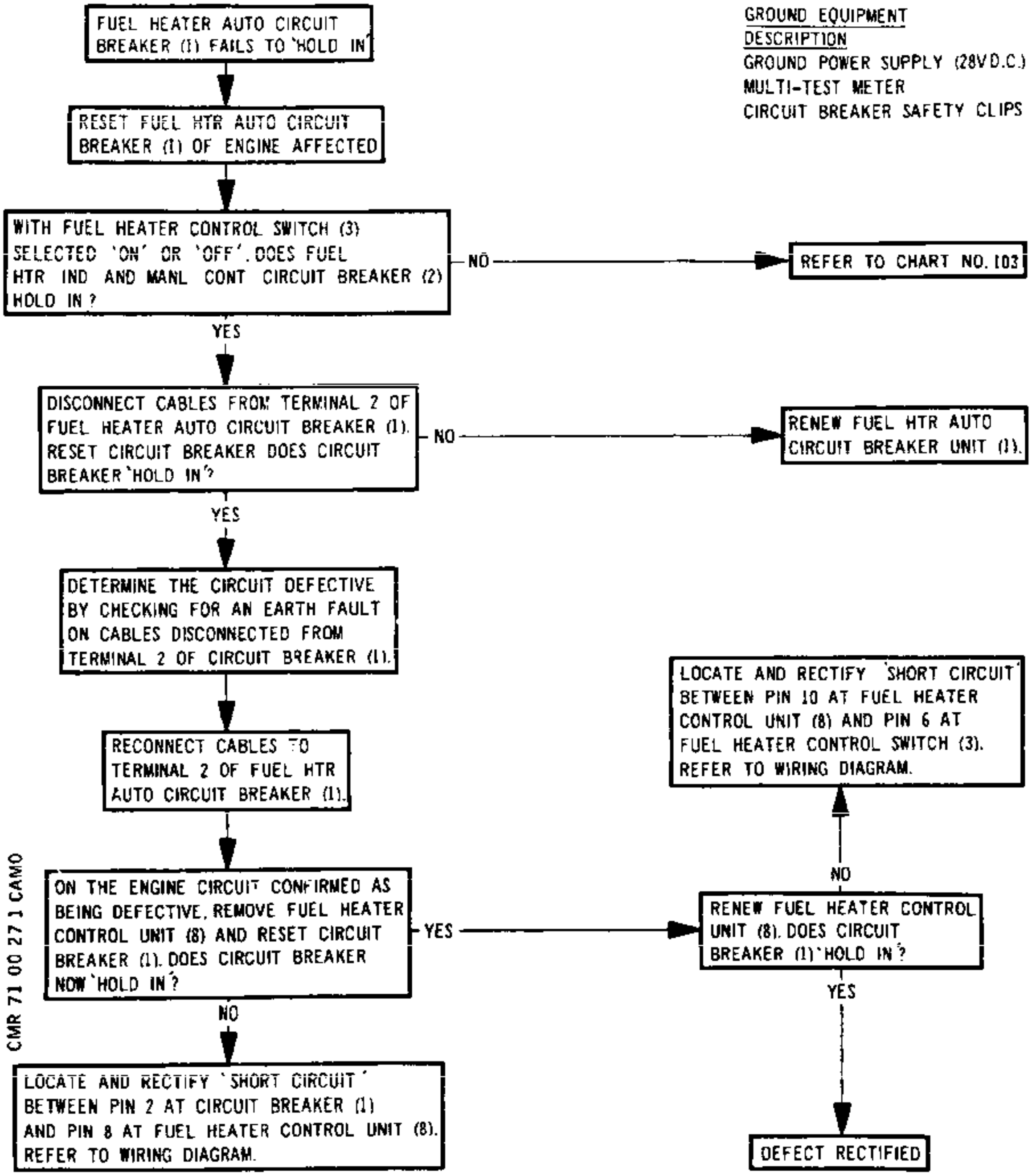
Chart 101 (Sheet 1 of 2)



R
R
R
R

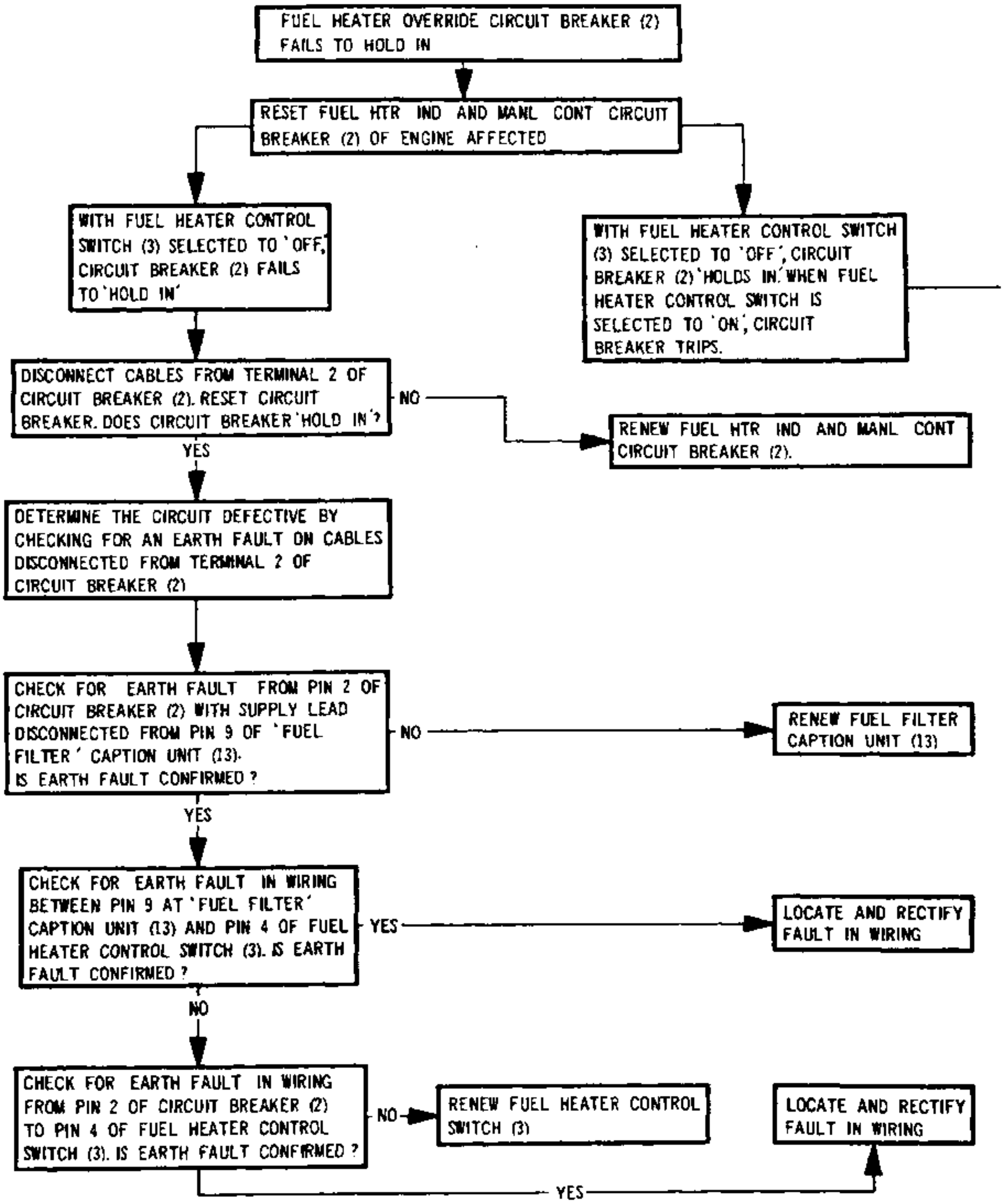
Chart 101 (Sheet 2 of 2)

GROUND EQUIPMENT DESCRIPTION
GROUND POWER SUPPLY (28V D.C.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 27 1 CAMO

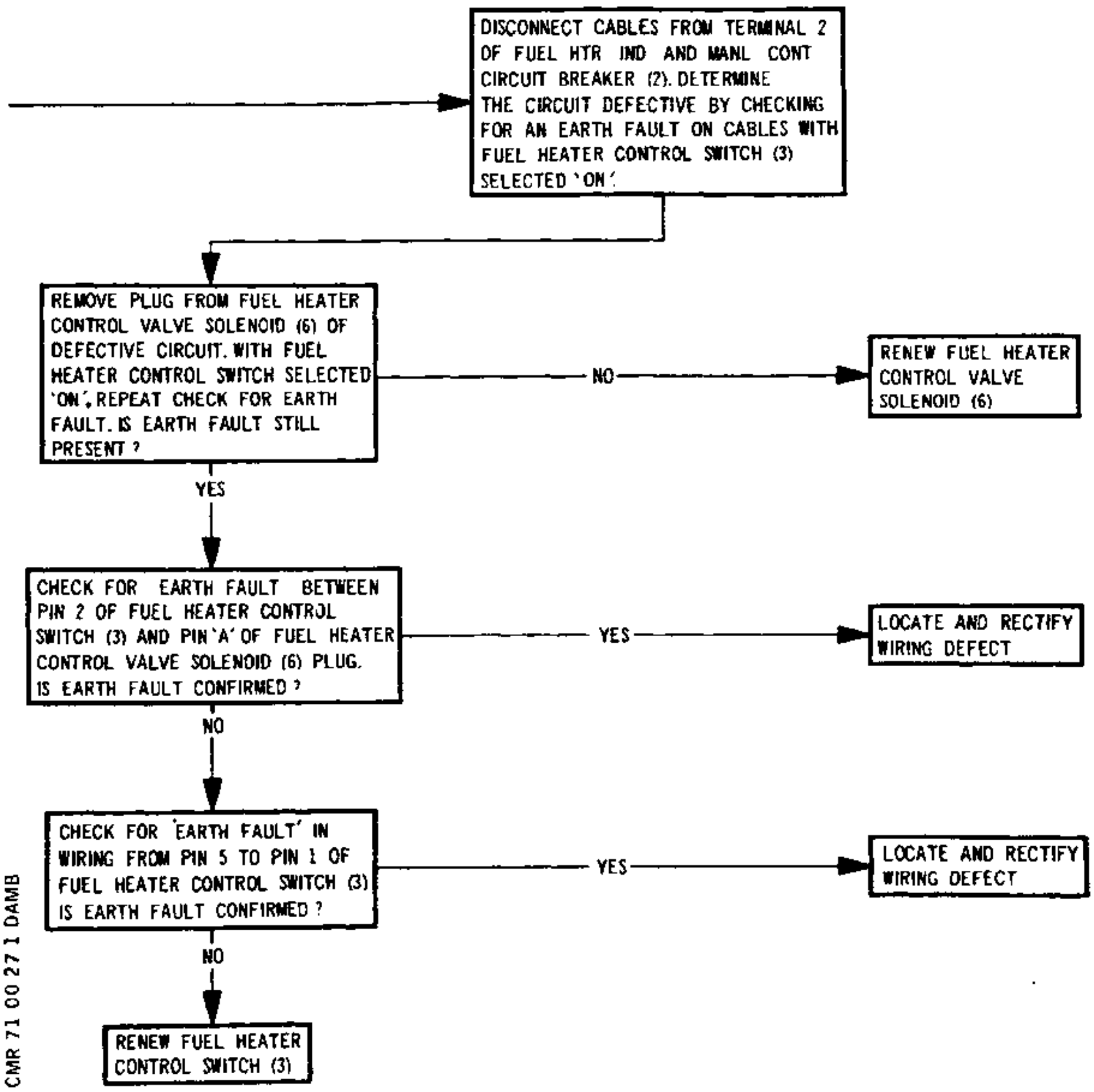
Chart 102



CMR 71 00 27 1 DAMA

Chart 103 (Sheet 1 of 2)

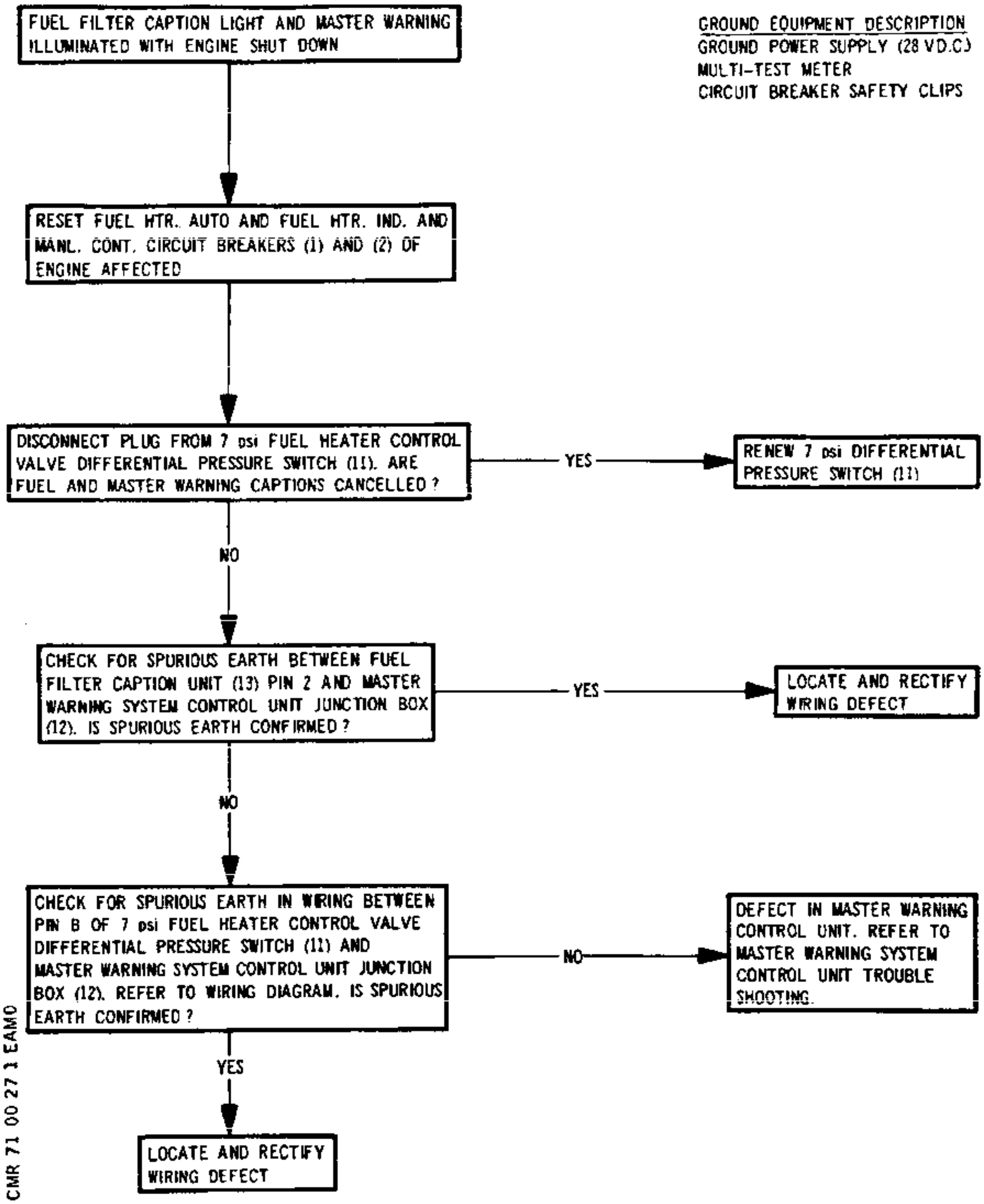
GROUND EQUIPMENT DESCRIPTION
GROUND POWER SUPPLY (28V D.C.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 27 1 DAMB

Chart 103 (Sheet 2 of 2)

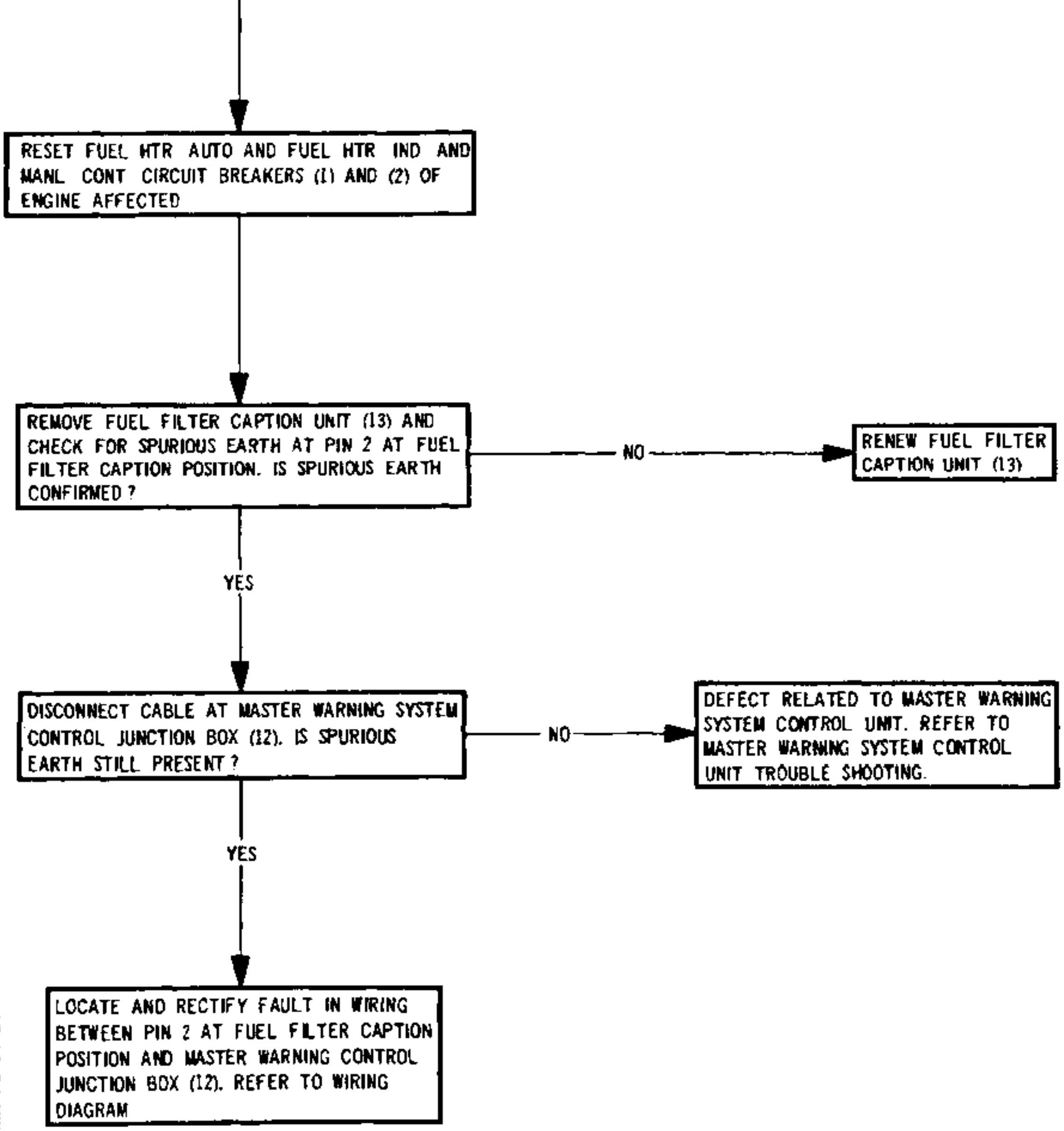
GROUND EQUIPMENT DESCRIPTION
GROUND POWER SUPPLY (28 V.D.C.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 27 1 EAMO

Chart 104

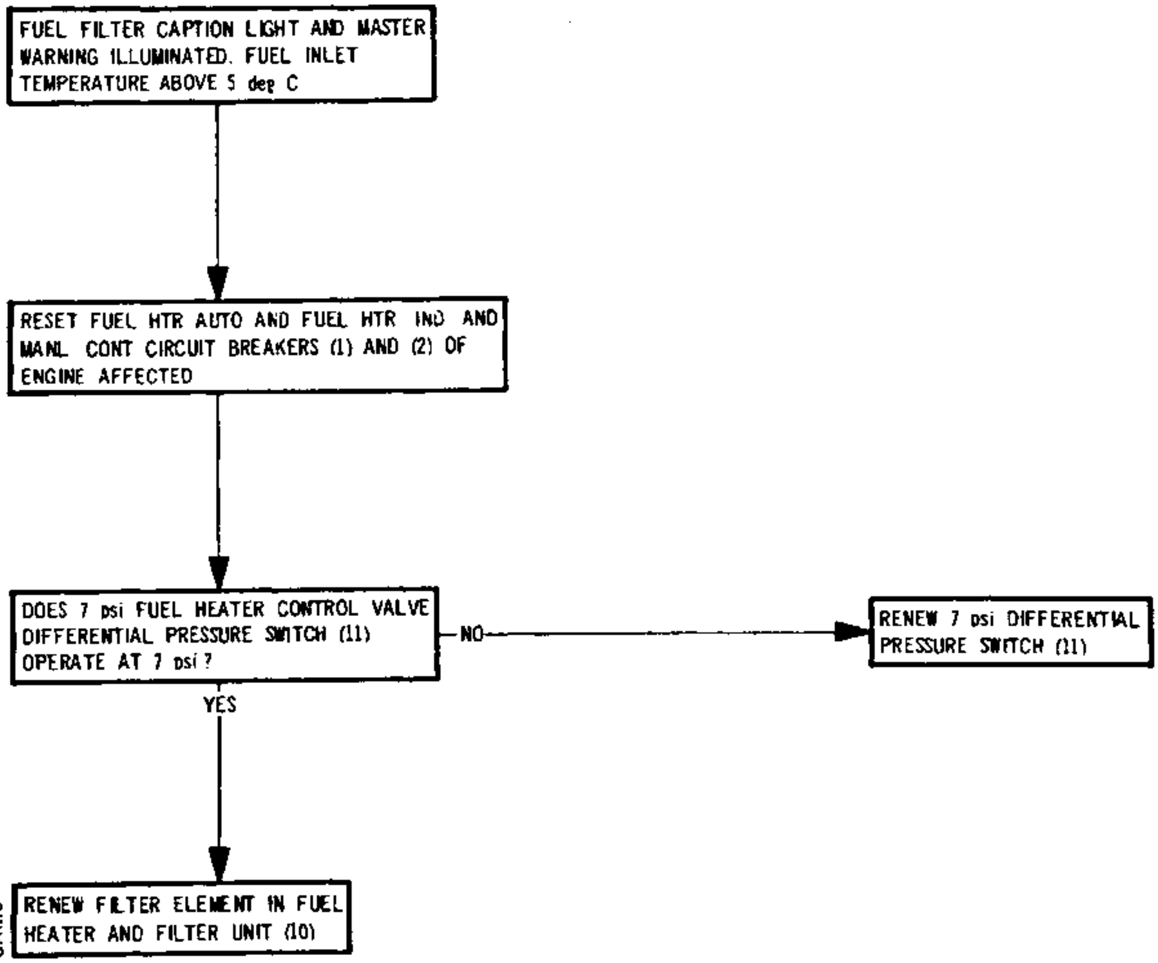
GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (28 V D.C.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 27 1 FAMO

Chart 105

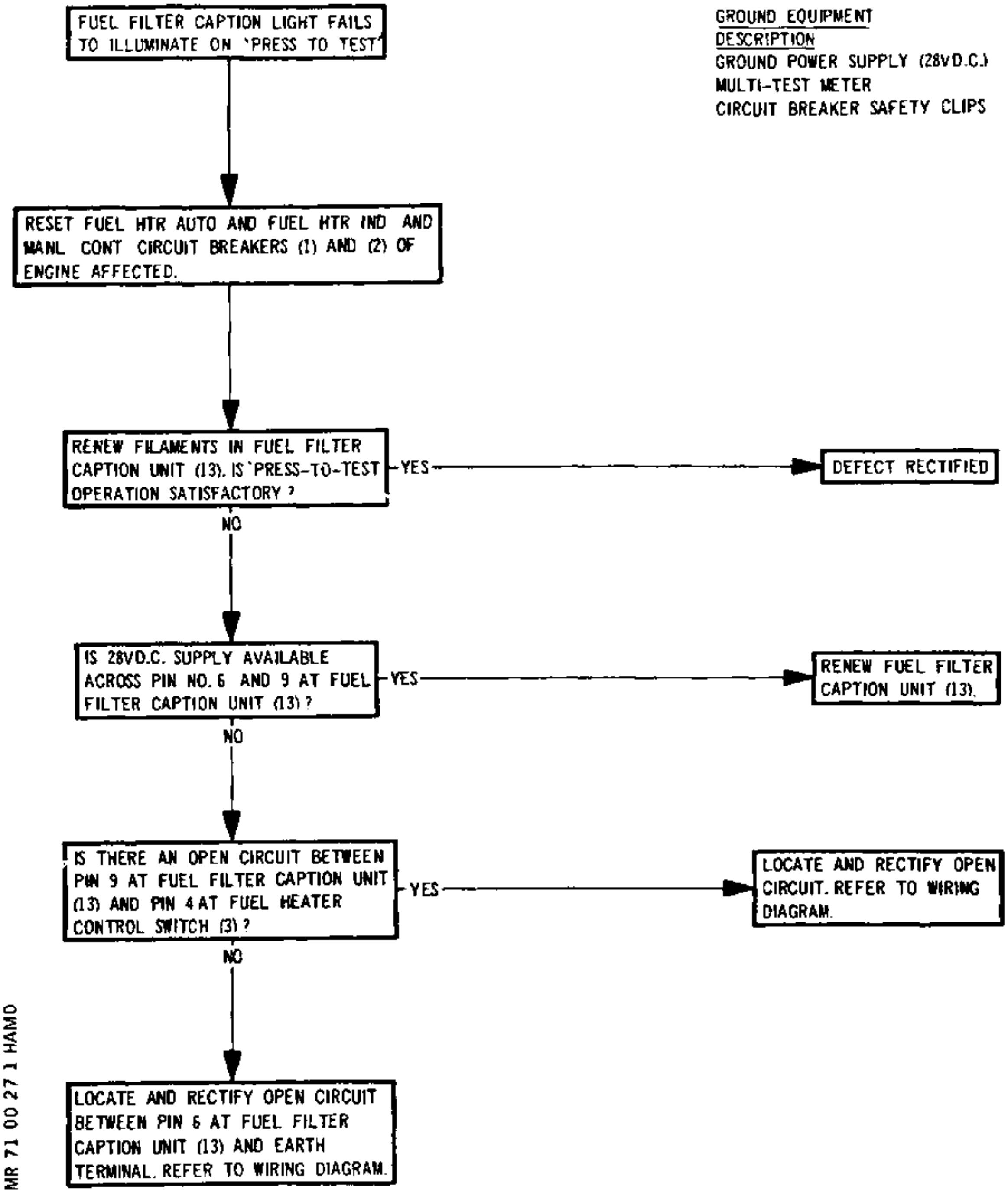
GROUND EQUIPMENT DESCRIPTION
GROUND POWER SUPPLY (28 V.D.C.)
MULTI-TEST METER
PRESSURISING EQUIPMENT (0-10 psi)
ADAPTER BASE
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 27 1 GAMO

Chart 106

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (28V D.C.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 27 1 HAMO

Chart 107

CR 32837/00C

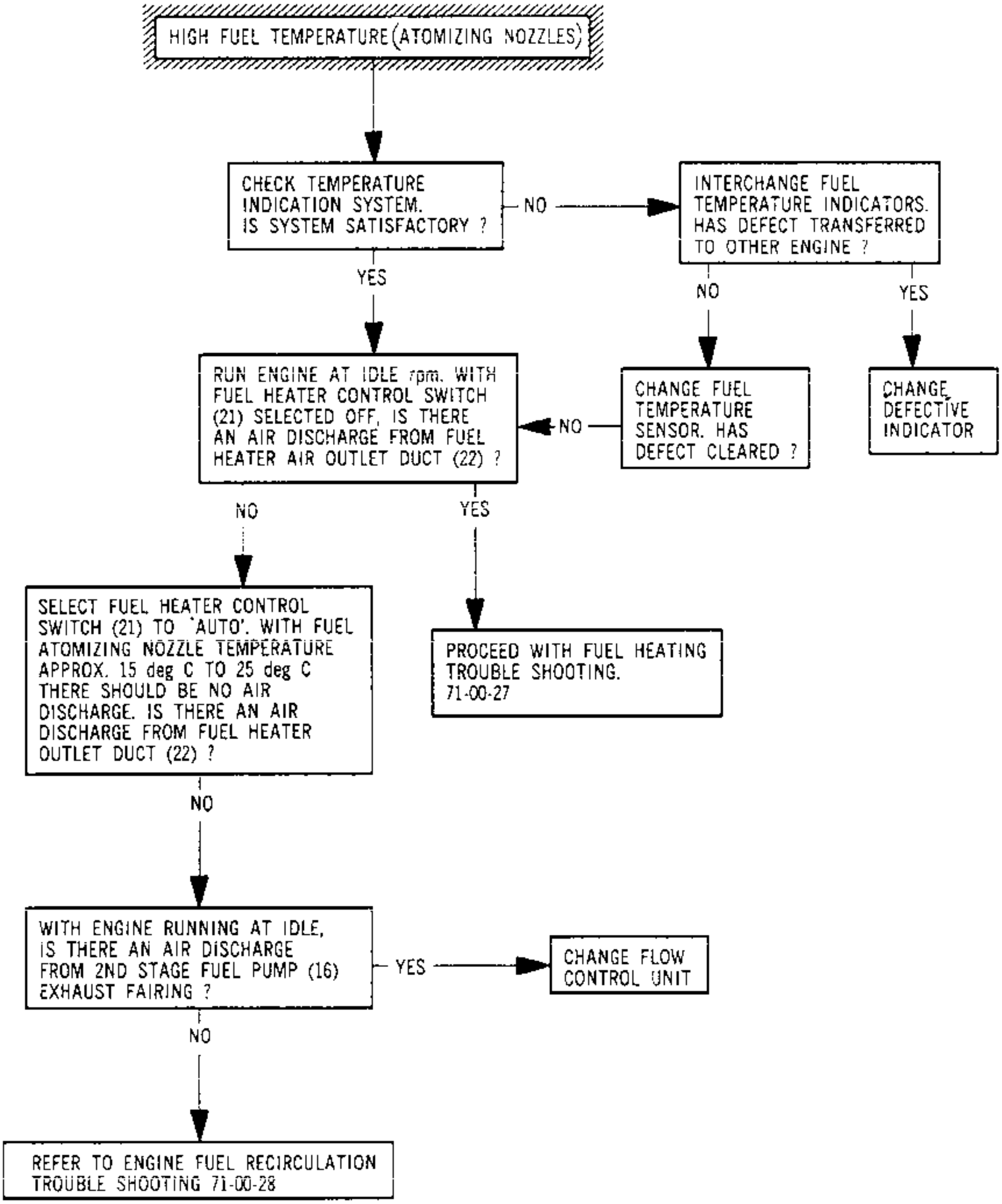


Chart 108

<u>GROUND EQUIPMENT</u>
<u>DESCRIPTION</u>
GROUND POWER SUPPLY 28V
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS

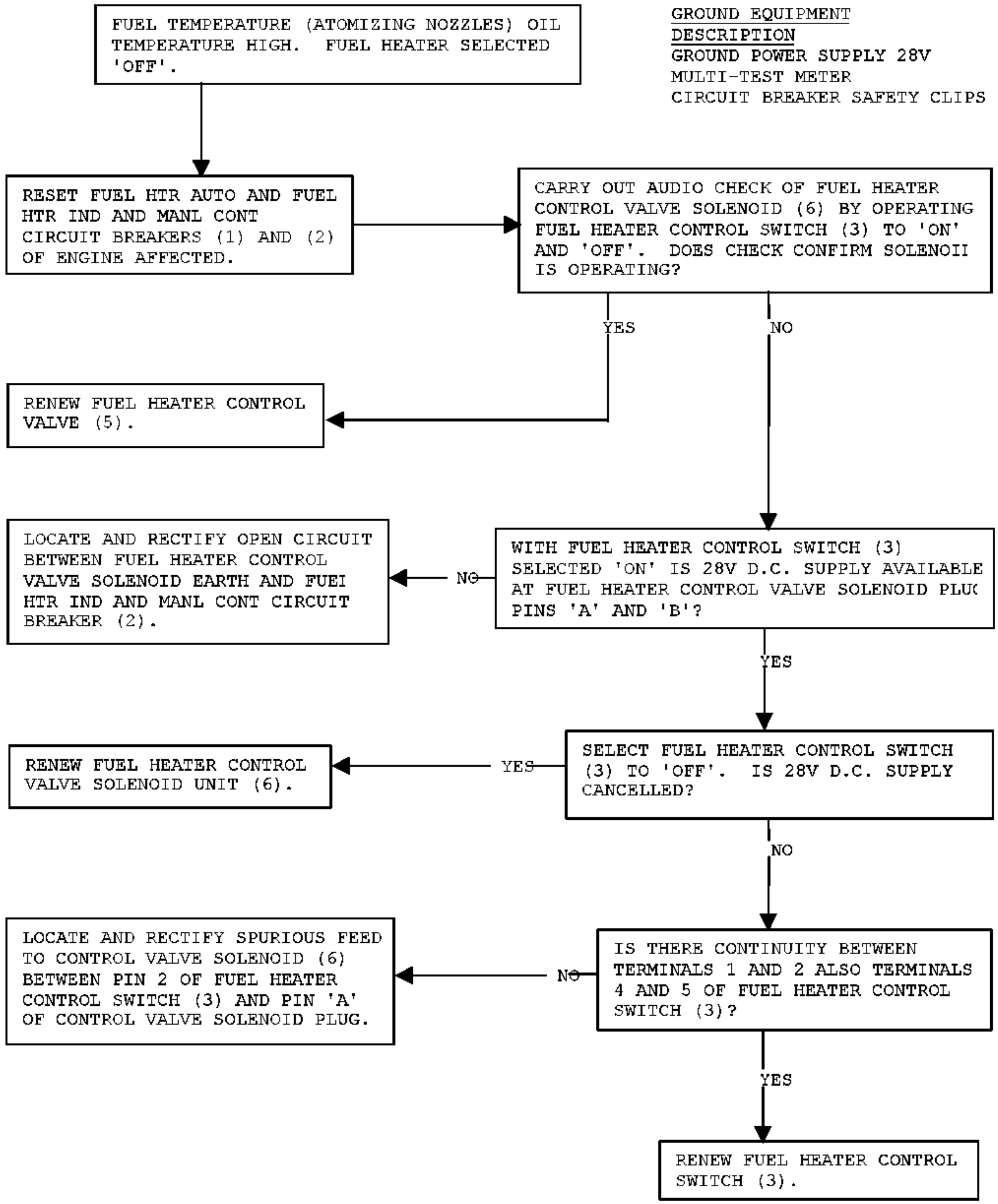


Chart 109

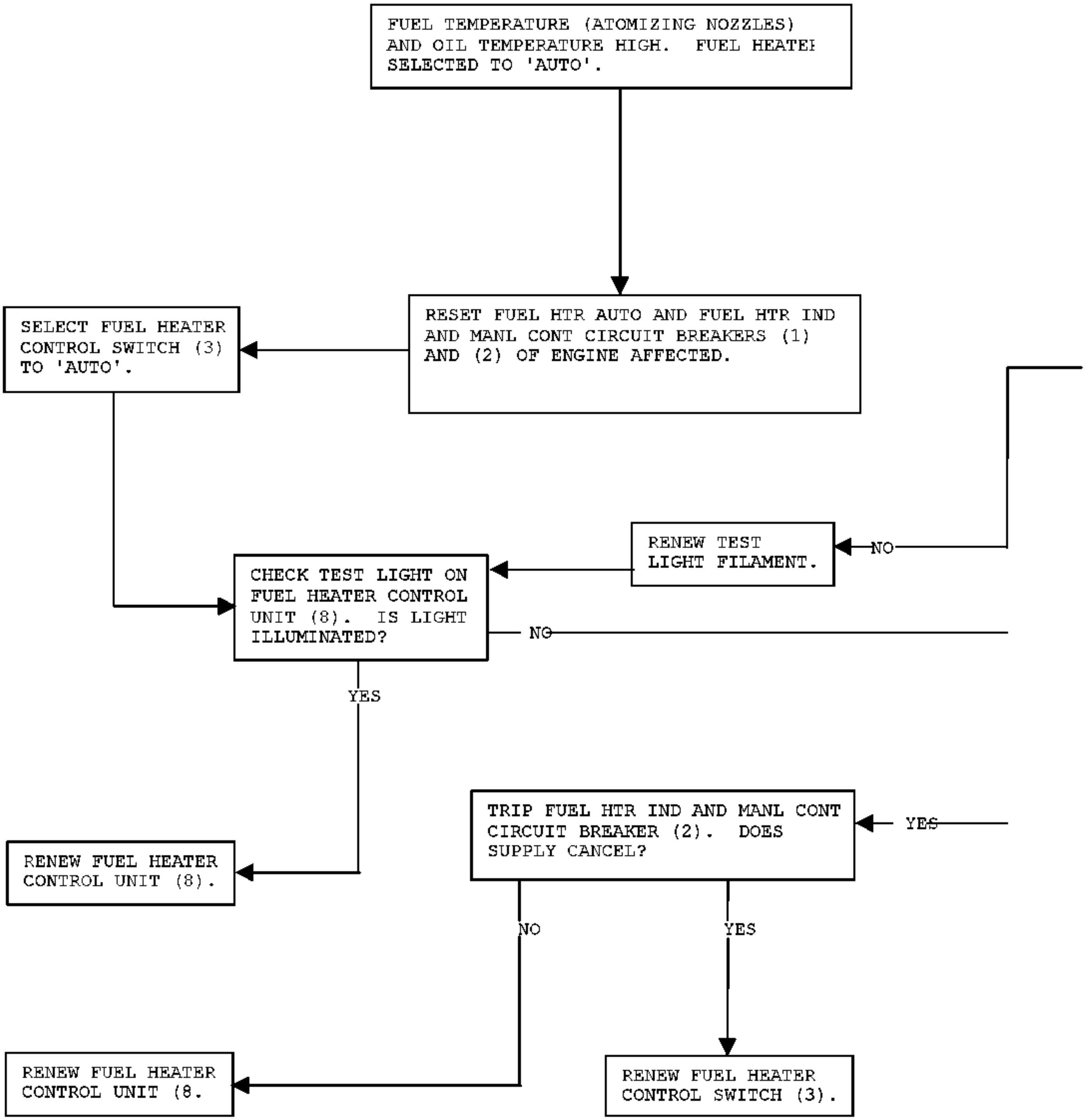


Chart 110 (Sheet 1 of 2)

<u>GROUND EQUIPMENT</u>
<u>DESCRIPTION</u>
POWER SUPPLY (28V D.C.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS

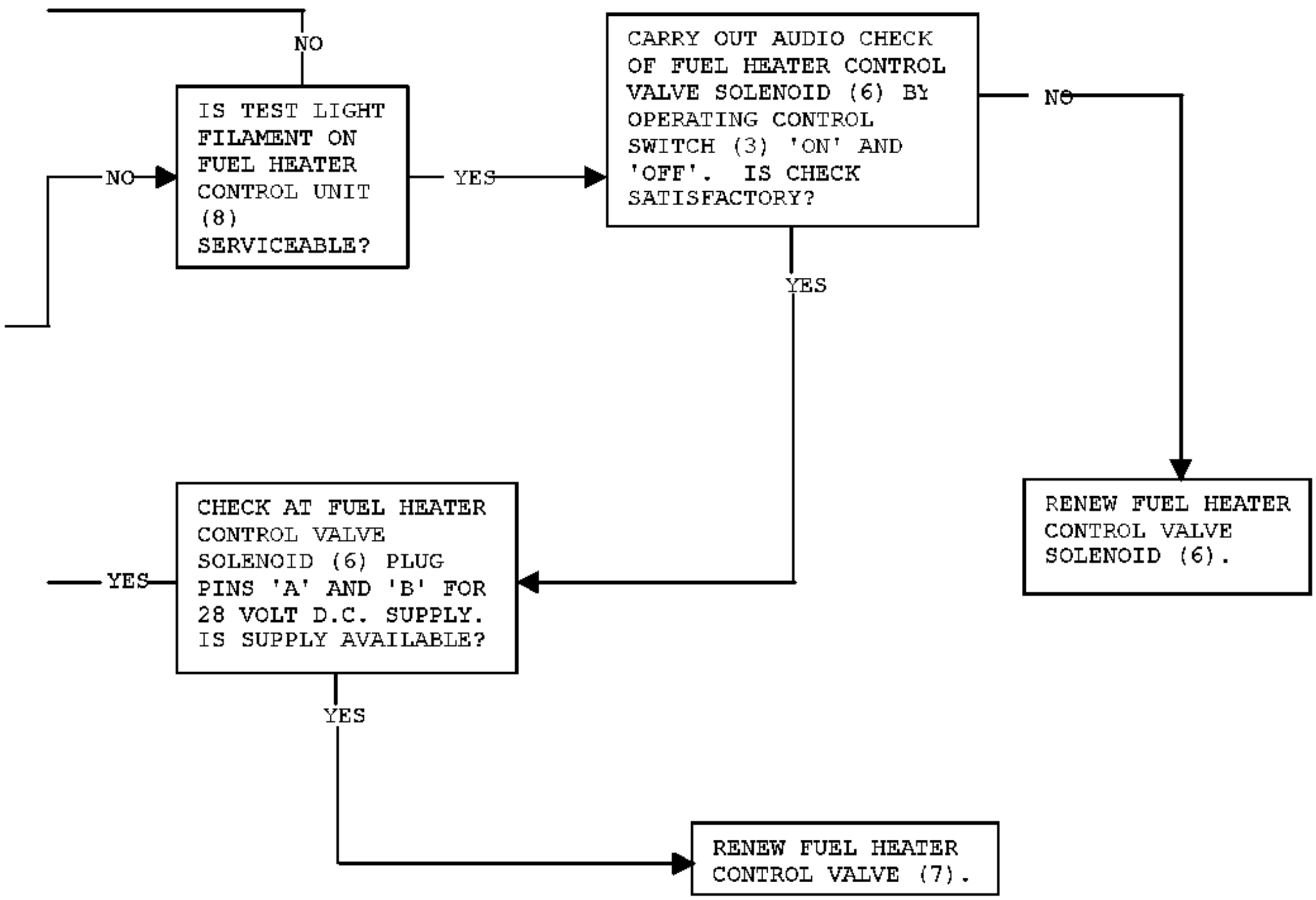


Chart 110 (Sheet 2 of 2)

FUEL TEMPERATURE (ATOMIZING NOZZLES) AND OIL TEMPERATURE LOW. FUEL FILTER CAPTION AND MASTER WARNING LIGHTS ILLUMINATED. FUEL HEATER SELECTED TO 'AUTO' TEMPERATURES AND CAPTIONS SATISFACTORY WITH FUEL HEATER SELECTED 'ON'

RESET FUEL HTR AUTO AND FUEL HTR IND AND MANL CIRCUIT BREAKERS (1) AND (2) OF ENGINE AFFECTED.

IS TEST LIGHT FILAMENT ON FUEL HEATER CONTROL UNIT (8) SERVICEABLE?

YES

NO

SELECT FUEL HEATER CONTROL SWITCH TO 'AUTO'.

DISCONNECT PLUG TO FUEL HEATER CONTROL THERMOMETER (9). ACROSS PINS 'A' AND 'B' OF PLUG CONNECT A RESISTANCE OF 150 OHMS. IS TEST LIGHT ILLUMINATED?

NO

YES

RENEW FUEL HEATER CONTROL THERMOMETER (9).

Chart 111 (Sheet 1 of 2)

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (28V D.C.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIP
DECADE RESISTANCE BOX

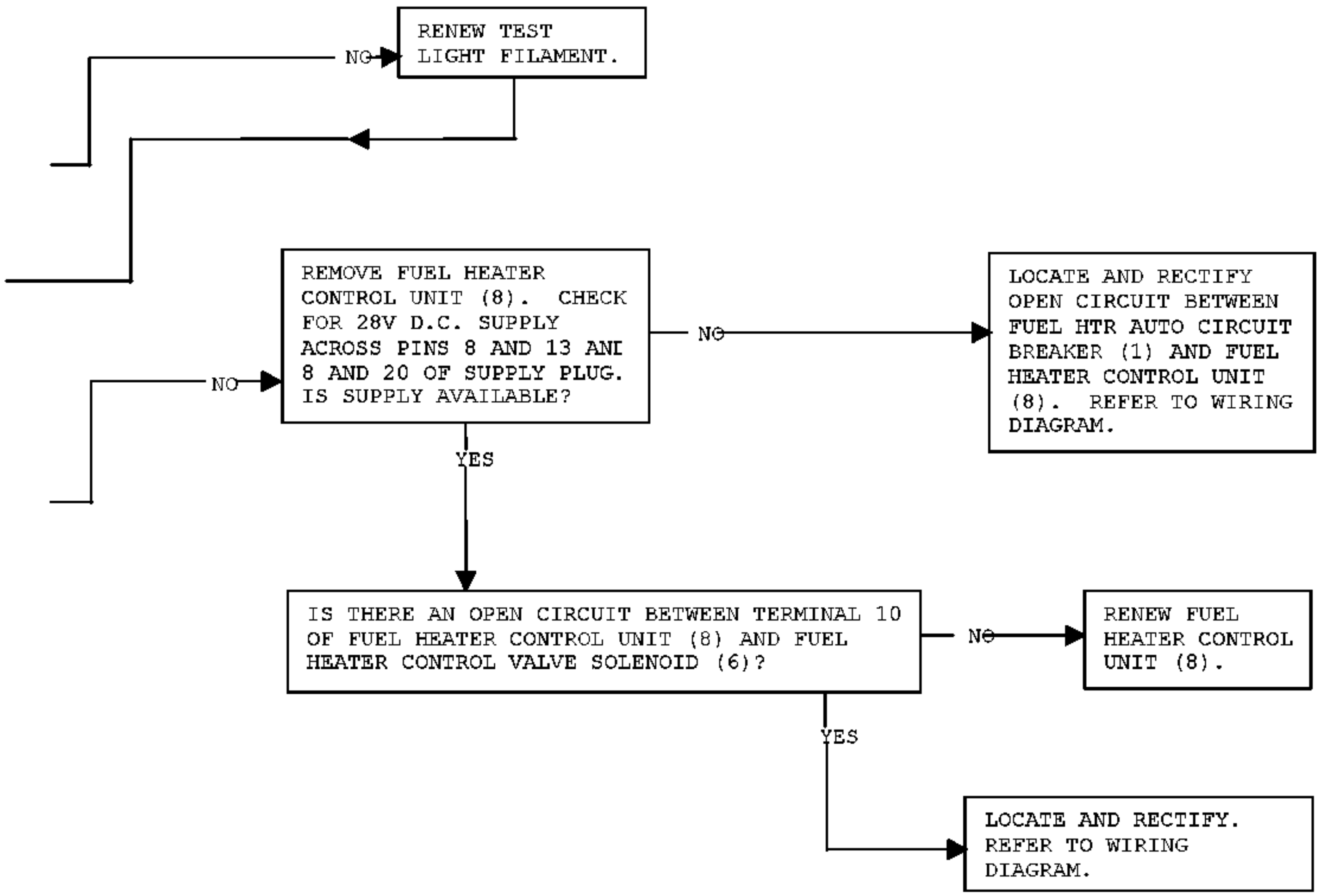


Chart 111 (Sheet 2 of 2)

GROUND EQUIPMENT DESCRIPTION
GROUND POWER SUPPLY (28V D.C.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS

FUEL TEMPERATURE (ATOMIZING NOZZLES) AND OIL TEMPERATURE LOW. FUEL FILTER CAPTION AND MASTER WARNING LIGHTS ILLUMINATED. FUEL HEATER SELECTED 'ON'.

↓

RESET FUEL HTR AUTO AND FUEL HTR IND AND MANL CONT CIRCUIT BREAKERS (1) AND (2) OF ENGINE AFFECTED.

↓

WITH FUEL HEATER CONTROL SWITCH (3) OPERATED 'ON' AND 'OFF', DOES AUDIO CHECK OF FUEL HEATER CONTROL VALVE SOLENOID (6) CONFIRM SOLENOID IS OPERATING?

- YES → RENEW FUEL HEATER CONTROL VALVE (7).
- NO ↓

WITH FUEL HEATER CONTROL SWITCH (3) SELECTED 'ON' IS 28V D.C. SUPPLY AVAILABLE AT PINS 'A' AND 'B' OF FUEL HEATER CONTROL VALVE SOLENOID (6) PLUG.

- YES → RENEW FUEL HEATER CONTROL VALVE SOLENOID (6).
- NO ↓

IS 28V D.C. SUPPLY AVAILABLE AT PIN 4 AT FUEL HEATER CONTROL SWITCH (3)?

- NO → RENEW FUEL HTR IND AND MANL CONT CIRCUIT BREAKER (2). IS 28V D.C. SUPPLY NOW AVAILABLE AT PIN 4 OF FUEL HEATER CONTROL SWITCH (3)?
  - YES → DEFECT RECTIFIED.
  - NO → LOCATE AND RECTIFY OPEN CIRCUIT BETWEEN PIN 2 AT CIRCUIT BREAKER (2) AND PIN 4 AT FUEL HEATER CONTROL SWITCH (3). REFER TO WIRING DIAGRAM.
- YES ↓

RENEW FUEL HEATER CONTROL SWITCH (3). WITH SWITCH SELECTED 'ON', IS 28V D.C. SUPPLY AVAILABLE AT FUEL HEATER CONTROL VALVE SOLENOID (6) PLUG PINS 'A' AND 'B'?

- YES → DEFECT RECTIFIED.
- NO ↓

CHECK FOR OPEN CIRCUIT BETWEEN PIN 2 AT FUEL HEATER CONTROL SWITCH (3) AND PIN 'A' AT FUEL HEATER CONTROL VALVE SOLENOID (6) PLUG. IS OPEN CIRCUIT CONFIRMED?

- YES → LOCATE AND RECTIFY OPEN CIRCUIT. REFER TO WIRING DIAGRAM.
- NO ↓

LOCATE AND RECTIFY OPEN CIRCUIT BETWEEN PIN B OF CONTROL VALVE SOLENOID (6) PLUG AND EARTH TERMINAL.

Chart 112

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ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1						
(1) Circuit breaker 28 V	-	15-216	H1331	Map Ref.All		
(2) Circuit breaker 28 V	-	5-213	H1333	Map Ref.B5		
(3) Fuel heater control switch	-	1-214	1H1335	-	73-14-00	
(4) Fuel heater air outlet duct	-	415	-	-	75-03-00	
(5) Second stage fuel pump	-	415	-	-	73-11-02	
(6) Fuel heater control valve solenoid	-	415	-	-	73-14-02	
(7) Fuel heater control valve	-	415	-	-	73-14-02	
(8) Fuel heater control unit	-	2-215	1H1336	-	73-14-11	
(9) Fuel heater control thermo-meter	-	415	-	-	73-14-05	
(10)Fuel heater and filter unit	-	415	-	-	73-14-01	
(11)Fuel heater control valve differential pressure switch (7 psi)	-	415	-	-	73-14-04	
(12)Master warning control unit junction box	-	7-216	US216-07 2A9	-		-

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
ENGINE NO.1						
(13)Fuel filter caption unit	-	1-214	1H1337	-	73-14-00	
ENGINE NO.2						
(1) Circuit breaker 28 V	-	15-215	H1332	Map Ref.E16		
(2) Circuit breaker 28 V	-	1-213	H1334	Map Ref.F8		
(3) Fuel heater control switch	-	1-214	2H1335	-	73-14-00	
(4) Fuel heater air outlet duct	-	425	-	-	75-03-00	
(5) Second stage fuel pump	-	425	-	-	73-11-02	
(6) Fuel heater control valve solenoid	-	425	-	-	73-14-02	
(7) Fuel heater control valve	-	425	-	-	73-14-02	
(8) Fuel heater control unit	-	1-215	2H1336	-	73-14-11	
(9) Fuel heater control thermometer	-	425	-	-	73-14-05	
(10)Fuel heater and filter unit	-	425	-	-	73-14-01	
(11)Fuel heater control valve differential pressure switch (7 psi)	-	425	-	-	73-14-04	
(12)Master	-	7-216	US216-07	-	-	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1 warning control unit junction box			4AX			
(13)Fuel filter caption unit	-	1-214	2H1337	-	73-14-00	
ENGINE NO.3						
(1) Circuit breaker 28 V	-	15-215	H1332	Map Ref.E16		
(2) Circuit breaker 28 V	-	1-213	H1334	Map Ref.F8		
(3) Fuel heater control switch	-	1-214	3H1335	-	73-14-00	
(4) Fuel heater air outlet duct	-	435	-	-	75-03-00	
(5) Second stage fuel pump	-	435	-	-	73-11-02	
(6) Fuel heater control valve solenoid	-	435	-	-	73-14-02	
(7) Fuel heater control valve	-	435	-	-	73-14-02	
(8) Fuel heater control unit	-	1-216	3H1336	-	73-14-11	
(9) Fuel heater control thermo-meter	-	435	-	-	73-14-05	
(10)Fuel heater and filter unit	-	435	-	-	73-14-01	
(11)Fuel heater control valve differential	-	435	-	-	73-14-04	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1 pressure switch (7 psi)						
(12)Master warning control unit junction box	-	7-216	US216-07 6AR	-	-	
(13)Fuel filter caption unit	-	1-214	3H1337	-	73-14-00	
ENGINE NO.4						
(1) Circuit breaker 28 V	-	15-216	H1331	Map Ref.All		
(2) Circuit breaker 28 V	-	5-213	H1333	Map Ref.B5		
(3) Fuel heater control switch	-	1-214	4H1335	-	73-14-00	
(4) Fuel heater air outlet duct	-	445	-	-	75-03-00	
(5) Second stage fuel pump	-	445	-	-	73-11-02	
(6) Fuel heater control valve solenoid	-	445	-	-	73-14-02	
(7) Fuel heater control valve	-	445	-	-	73-14-02	
(8) Fuel heater control unit	-	2-216	4H1336	-	73-14-11	
(9) Fuel heater control thermometer	-	445	-	-	73-14-05	
(10)Fuel heater and filter unit	-	445	-	-	73-14-01	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1						
(11)Fuel heater control valve differential pressure switch (7 psi)	-	445	-	-	73-14-04	
(12)Master warning control unit junction box	-	7-216	US216-07 8AV	-	-	
(13)Fuel filter caption unit	-	1-214	4H1337	-	73-14-00	

Component Identification
Table 101

ENGINE FUEL RECIRCULATION - TROUBLE SHOOTING

1. General

A. The engine recirculation valve is energized "open" when the engine recirculation valve switch is selected "OPEN" or the HP valve is selected "OFF" (Irrespective of recirculation valve switch position).

B. The valve is normally selected open toward the end of supersonic cruise to maintain the Fuel Temperature (atomizing nozzles) within the permitted limit.

Should the valve fail shut due to system defect it will be most apparent shortly after the engine power has been reduced for the descent.

Over a period of time, due to the higher fuel temperature the engine oil inlet temperature and the CSD/IDG temperature may rise slightly compared with that on the other engines.

C. The valve is automatically selected open when the HP valve is selected off to prevent:

(1) Fuel temperature rise in fuel pump when engine is shut down in flight and is windmilling.

(2) Pressure rise in fuel feed pipes (due to temperature soak) when LP cock and HP valve are both closed.

D. Should the valve fail in the open position the defect will not become immediately apparent but may be noted over a period of supersonic cruise.

It is doubtful if the effect on Engine oil inlet and CSD/IDG temperature will be discernible.

E. A high fuel temperature (atomizing nozzles) unaccompanied by the rise of any other fuel temperature and occurring at Take-Off, Climb, or Cruise conditions is probably due to a defective Fuel Heater system - refer to Fuel Heater trouble shooting.

F. Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is detailed in Table 101.

2. Preparation

WARNING: COMPLY WITH ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

A. Ensure that external electrical power supply is connected and switched on.

B. Consult Chart 101 and carry out actions indicated to determine which of the Trouble Shooting charts is applicable.

3. Restore to Flight Standard

A. Complete and check any necessary rectification.

B. Reconnect all points where disconnection has been made during checking and rectification procedures.

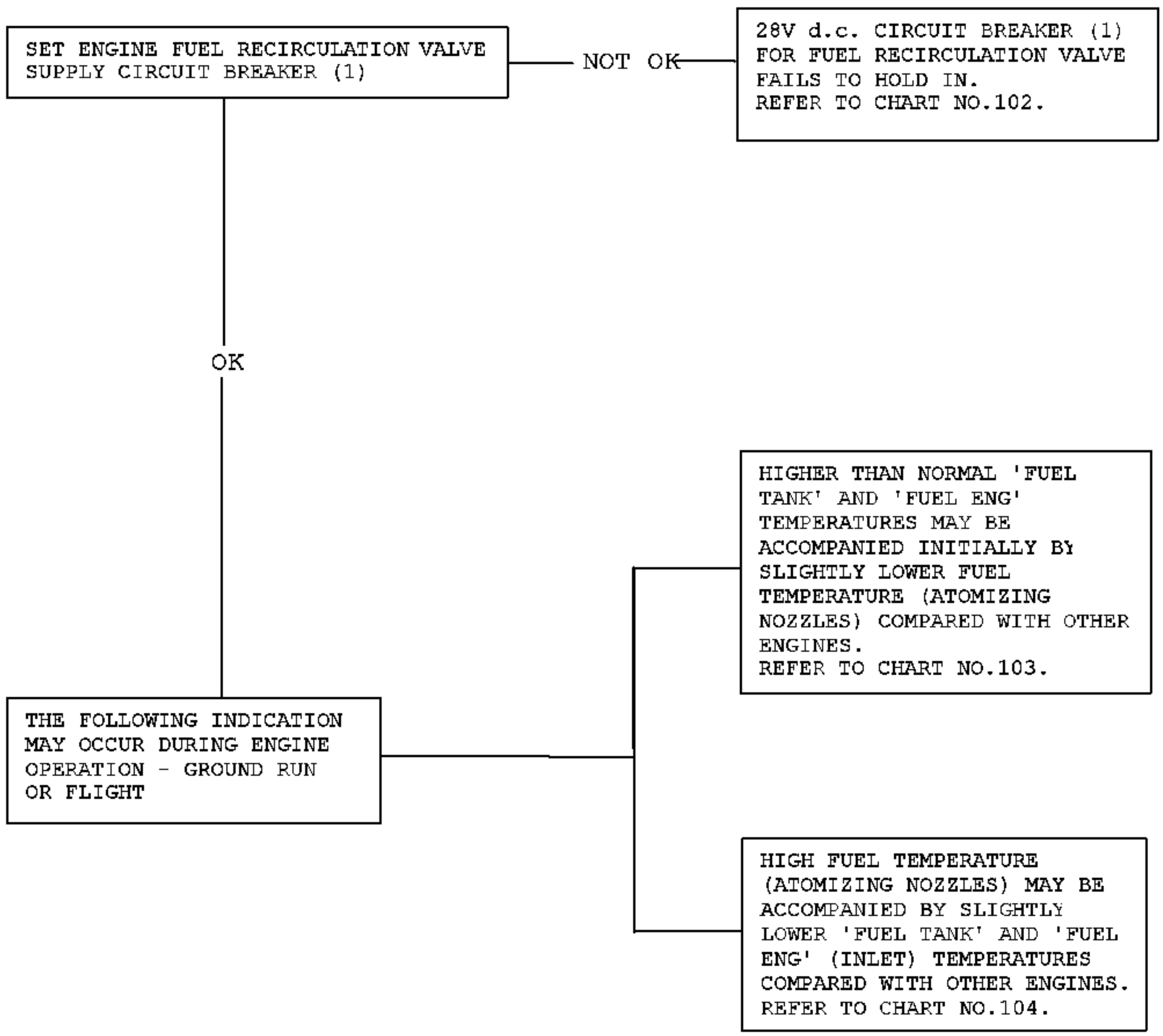
SET ENGINE FUEL RECIRCULATION VALVE SUPPLY CIRCUIT BREAKER (1)
NOT OK
28V d.c. CIRCUIT BREAKER (1) FOR FUEL RECIRCULATION VALVE FAILS TO HOLD IN. REFER TO CHART NO.102.
OK
THE FOLLOWING INDICATION MAY OCCUR DURING ENGINE OPERATION - GROUND RUN OR FLIGHT
HIGHER THAN NORMAL 'FUEL TANK' AND 'FUEL ENG' TEMPERATURES MAY BE ACCOMPANIED INITIALLY BY SLIGHTLY LOWER FUEL TEMPERATURE (ATOMIZING NOZZLES) COMPARED WITH OTHER ENGINES. REFER TO CHART NO.103.
HIGH FUEL TEMPERATURE (ATOMIZING NOZZLES) MAY BE ACCOMPANIED BY SLIGHTLY LOWER 'FUEL TANK' AND 'FUEL ENG' (INLET) TEMPERATURES COMPARED WITH OTHER ENGINES. REFER TO CHART NO.104.

Chart 101

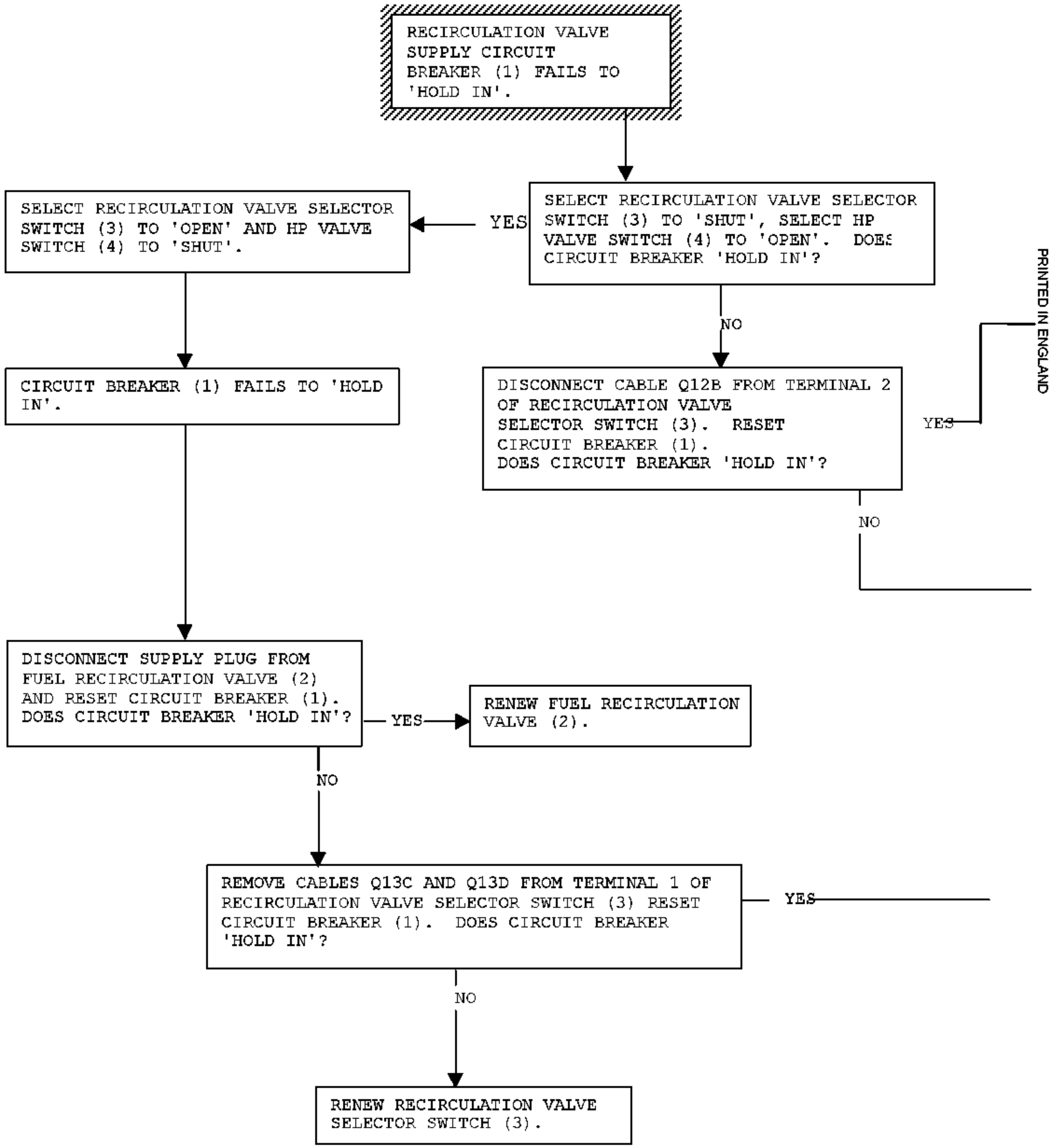

Chart 102 (Sheet 1 of 2)

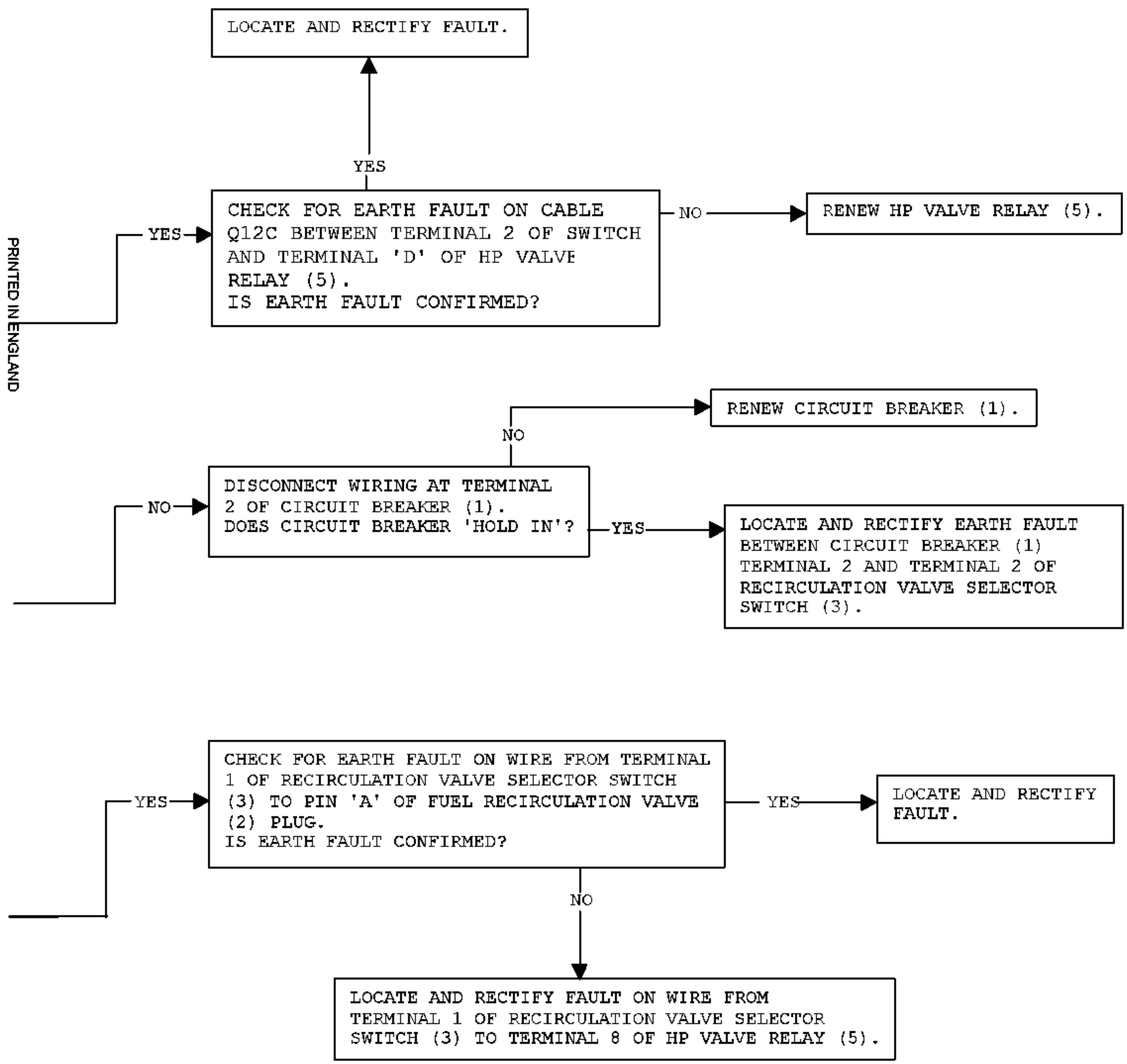

Chart 102 (Sheet 2 of 2)

HIGHER THAN NORMAL 'FUEL TANK' AND 'FUEL ENG' TEMPERATURES MAY BE ACCOMPANIED INITIALLY BY SLIGHTLY LOWER FUEL TEMPERATURE 'ATOMIZING NOZZLES' COMPARED WITH OTHER ENGINES. (INDICATIVE OF FUEL RECIRCULATION VALVE OPEN).

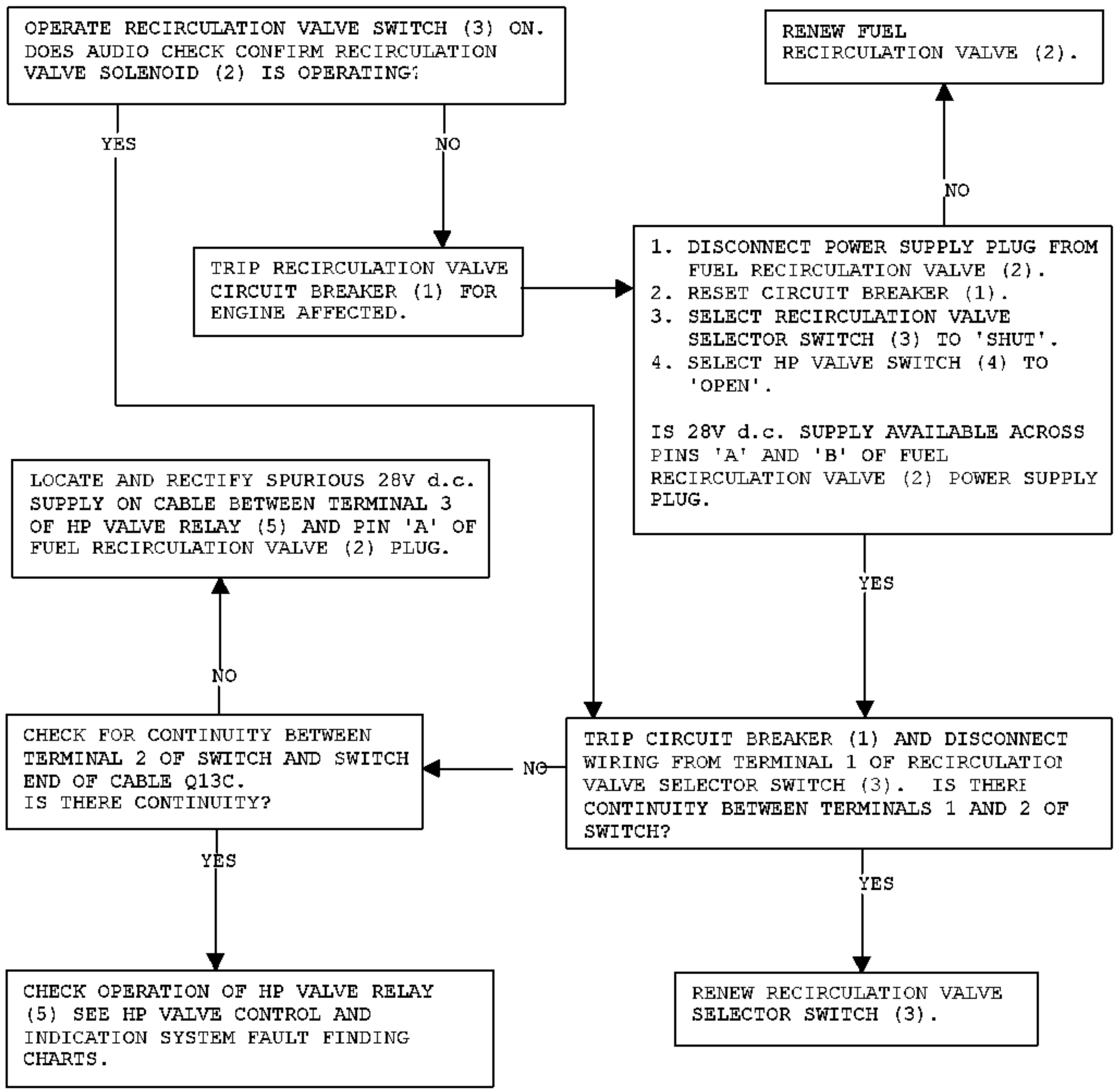

Chart 103

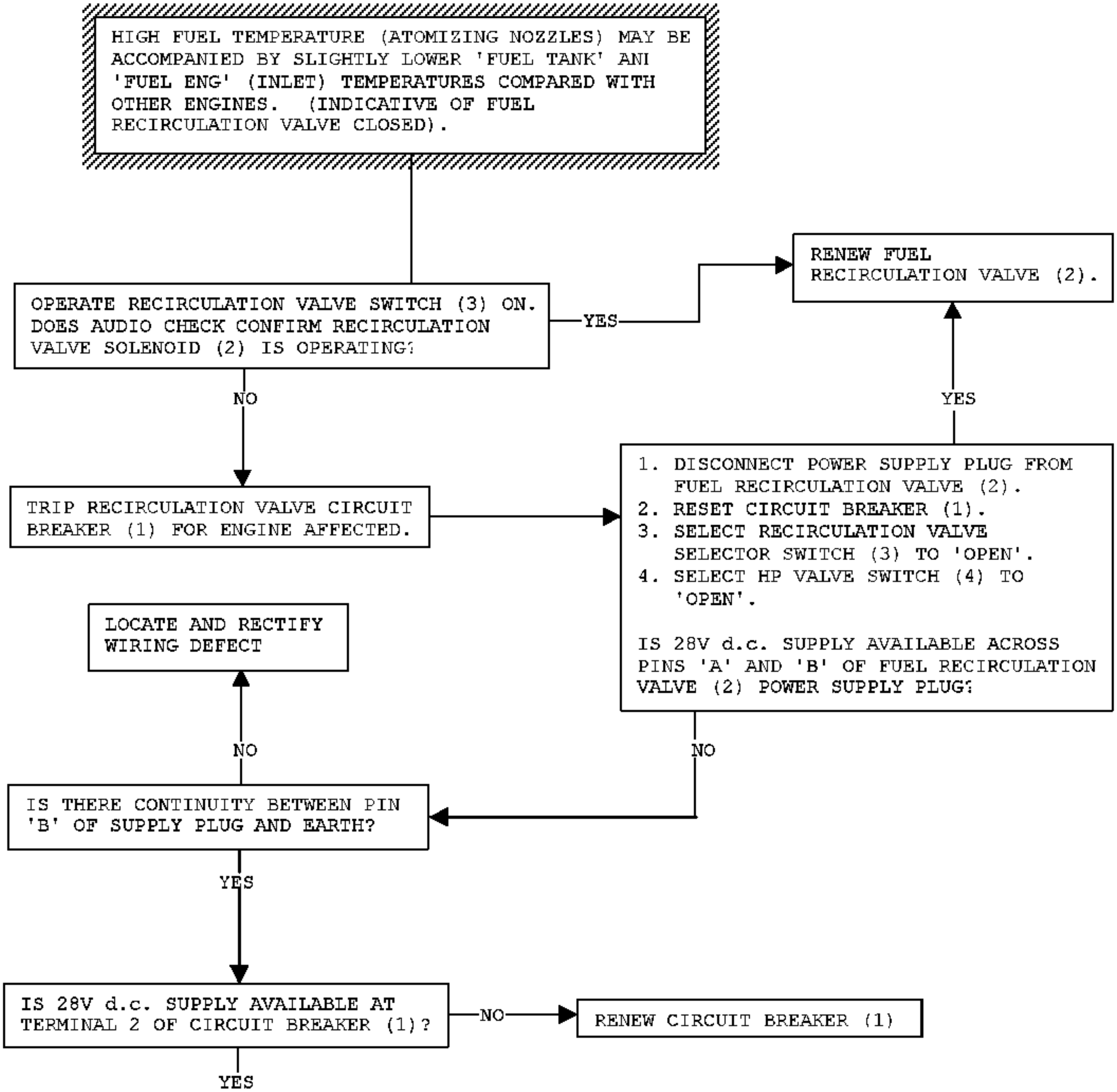

Chart 104 (continued)

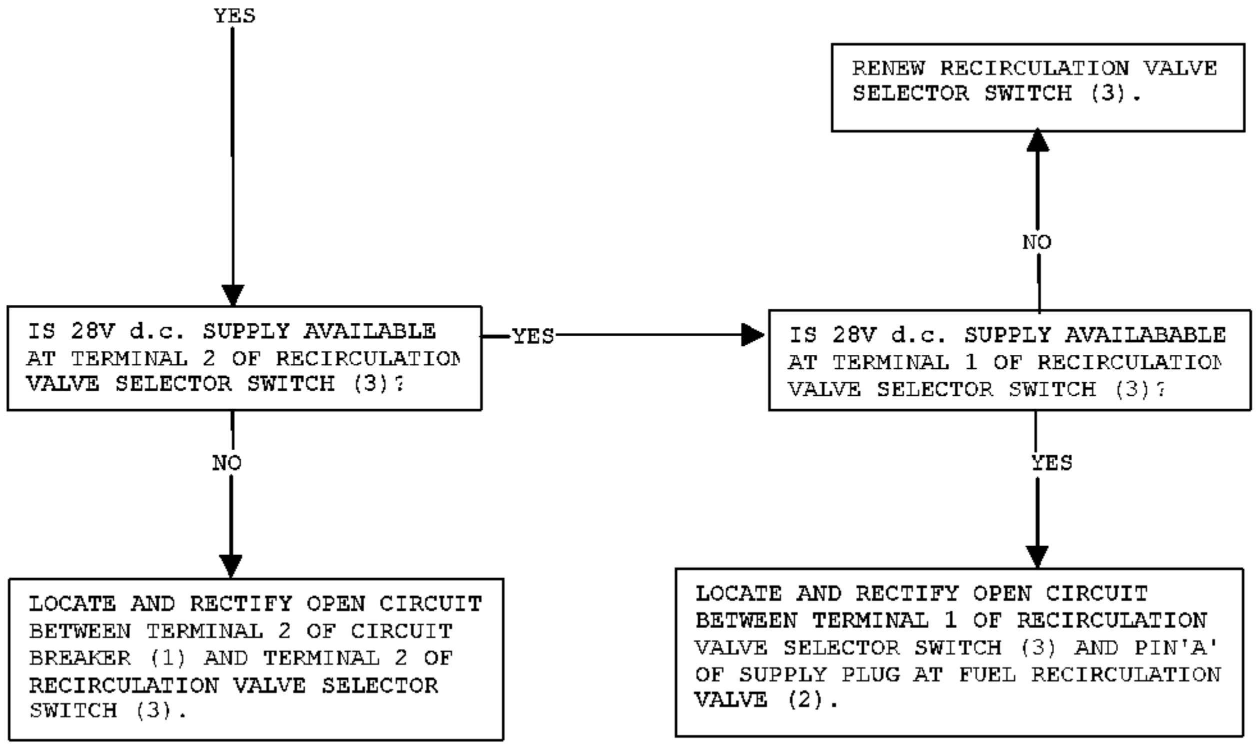

Chart 104 (concluded)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1						
(1) Circuit breaker 28 V	-	3-213	1Q791	Map ref.G1	-	
(2) Fuel recirculation valve	-	415	-	-	73-12-01	
(3) Recircula-tion valve selector switch	-	1-214	1Q792	-	73-10-00	
(4) HP valve switch	-	4-211	1K132	-	73-20-00	
(5) HP valve relay	-	19-123	1K134	-	73-20-00	
ENGINE NO.2						
(1) Circuit breaker 28 V	-	1-213	2Q791	Map ref.E5	-	
(2) Fuel recirculation valve	-	425	-	-	73-12-01	
(3) Recircula-tion valve selector switch	-	1-214	2Q792	-	73-10-00	
(4) HP valve switch	-	4-211	2K132	-	73-20-00	
(5) HP valve relay	-	19-123	2K134	-	73-20-00	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.3						
(1) Circuit breaker 28 V	-	1-213	31Q791	Map ref.E6	-	
(2) Fuel recirculation valve	-	435	-	-	73-12-01	
(3) Recircula-tion valve selector switch	-	1-214	3Q792	-	73-10-00	
(4) HP valve switch	-	4-211	3K132	-	73-20-00	
(5) HP valve relay	-	20-123	3K134	-	73-20-00	
ENGINE NO.4						
(1) Circuit breaker 28 V	-	3-213	4Q791	Map ref.G2	-	
(2) Fuel recirculation valve	-	445	-	-	73-12-01	
(3) Recircula-tion valve selector switch	-	1-214	4Q792	-	73-10-00	
(4) HP valve switch	-	4-211	4K132	-	73-20-00	
(5) HP valve relay	-	20-123	4K134	-	73-20-00	

Component Identification
Table 101

ENGINE IGNITION - TROUBLE SHOOTING

WARNING: HIGH ENERGY CAN BE LETHAL. COMPLY WITH SAFETY PRECAUTIONS DETAILED IN 12-00-00 AND 24-00-00.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

A defect can be determined with the aid of trouble shooting procedures (Ref. para.3), and traced through OK and NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered, and all previous operations involving the faulty equipment, to ensure that the operations are OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the initial assumption that electrical wiring is serviceable and that power is available to the circuit breakers, unless otherwise stated. If the fault is not found in the equipment, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

2. Preparation

A. Make available electrical ground power (Ref, 24-41-00).

B. Place the LP VALVE switch on panel 5-214, for the appropriate engine, to SHUT 1 or SHUT 2; check that the associated magnetic indicator shows SHUT.

R C. Trip the following circuit breakers and fit safety clips.

	SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
R	Engine No. 1			
R	ENG 1 & 4 AIR START CONT	15-215	K181	C15
R	ENG 1 SEC AIR DOOR MTR SUP	2-213	1K247	C10
R	ENG 1 BAY COOLING FLAP CONT & IND	3-213	1K231	F1
R	ENG 1 REHEAT CONT	15-216	1K1542	E9
R	ENG 1 LP VALVE SUP 1	15-216	1Q1	C1
R	ENG 1 LP VALVE SUP 2	16-215	1Q2	-
R	ENG 1 START FUEL PUMP SUP	2-213	1Q812	J6
R	ENG 1 HP VALVE CONT	3-213	1K131	C1
R	Engine No. 2			
R	ENG 2 & 3 AIR START CONT	15-216	K182	D11
R	ENG 2 SEC AIR DOOR MTR SUP	2-213	2K247	F10
R	ENG 2 BAY COOLING FLAP CONT & IND	1-213	2K231	D3
R	ENG 2 REHEAT CONT	15-215	2K1542	D15
R	ENG 2 LP VALVE SUP 2	15-215	2Q2	C19
R	ENG 2 LP VALVE SUP 1	15-216	2Q1	F2
R	ENG 2 START FUEL PUMP SUP	1-213	2Q812	K6
R	ENG 2 HP VALVE CONT	1-213	2K131	C3
R	Engine No. 3			
R	ENG 2 & 3 AIR START CONT	15-216	K182	D11
R	ENG 3 SEC AIR DOOR MTR SUP	4-213	3K247	A19
R	ENG 3 BAY COOLING FLAP CONT & IND	1-213	3K231	D4
R	ENG 3 REHEAT CONT	15-215	3K1542	D16
R	ENG 3 LP VALVE SUP 2	15-215	3Q2	C20
R	ENG 3 LP VALVE SUP 1	15-216	3Q1	F1
R	ENG 3 START FUEL PUMP SUP	1-213	3K812	L6
R	ENG 3 HP VALVE CONT	1-213	3K131	C4
R	Engine No. 4			
R	ENG 1 & 4 AIR START CONT	15-215	K181	C15
R	ENG 4 SEC AIR DOOR MTR SUP	4-213	4K247	F19
R	ENG 4 BAY COOLING FLAP CONT & IND	3-213	3K231	F2
R	ENG 4 REHEAT CONT	15-216	4K1542	E10
R	ENG 4 LP VALVE SUP 1	15-216	4Q1	C2
R	ENG 4 LP VALVE SUP 2	16-215	4Q2	-
R	ENG 4 START FUEL PUMP & SUP	1-213	4Q812	M6
R	ENG 4 HP VALVE CONT	3-213	4K131	C2

R D. Carry out the fault finding procedures (Ref.para.3).

R E. Conclusion

R (1) Reset the circuit breakers previously tripped.

R (2) If not required for other servicing disconnect
R electrical ground power (Ref. 24-41-00).

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3. Trouble Shooting

A. Set circuit breakers (1),(2),(3) and (4) for the appropriate engine plus cb (1) of engine No.1 and cb (3) of engine No.4.

NOT OK — Circuit breaker fails to hold in - Chart 101.

OK

B. Set debow switch (16) to "DEBOW". With ignition selector switch (5) set to 'LH', 'RH' or 'BOTH', as appropriate, press ignitor control switch (6) - switch (6) should latch in; green ignition caption RH, (12) or LH, (13), (or both) should illuminate; igniter plug RH, (10), LH, (11) or both should spark.

NOT OK

1. Ignition control switch fails to latch in - Charts 102 to 105
2. Green ignition caption RH (12) (or LH (13)) fails to illuminate - Chart 106.
3. Igniter plug RH (10) (or LH (11)), fails to spark - Chart 107.
4. Igniter plugs RH (10), LH (11) fail to spark and green captions (RH (12), LH (13), fail to illuminate - Chart 108 to 111.

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CIRCUIT BREAKER FAILS TO HOLD IN

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLIES:	
200V, 3PH; 28V DC	-
MULTIMETER	-
CIRCUIT BREAKER	
SAFETY CLIPS	-

Disconnect wire(s) from terminal 2 of C/B -check if C/B remains set

NO → Renew C/B.

YES ↓

Check wiring between C/B and equipment for short (Ref. Wiring Diagram Manual).

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Chart 101

WITH ENGINE 1 DEBOW SWITCH AT "DEBOW", IGNITION CONTROL SWITCH FAILS TO LATCH IN.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLIES:	
200V, 3PH; 28V DC	-
MULTIMETER	-
CIRCUIT BREAKER	
SAFETY CLIPS	-

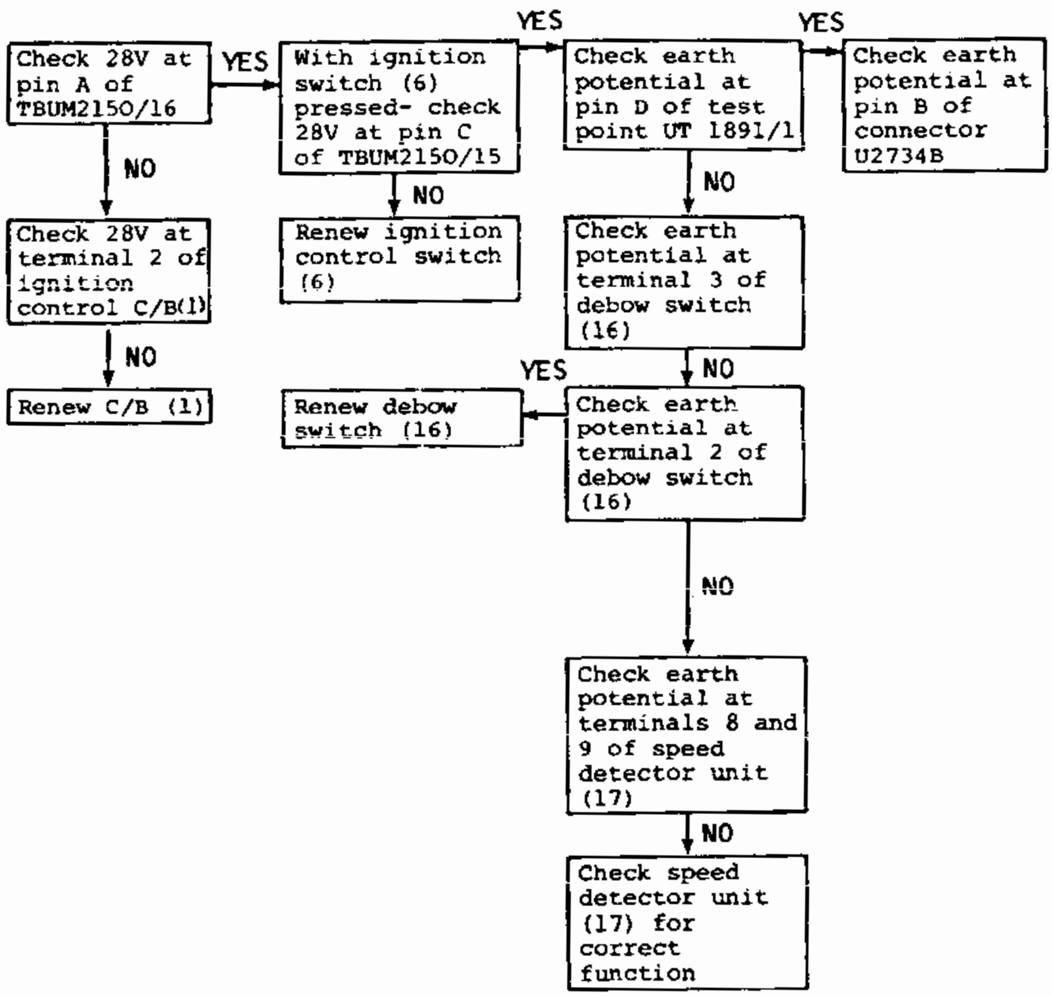

Chart 102

WITH ENGINE 2 DEBOW SWITCH AT "DEBOW", IGNITION CONTROL SWITCH FAILS TO LATCH IN

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLIES:	
200V, 3PH; 28V DC	-
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-

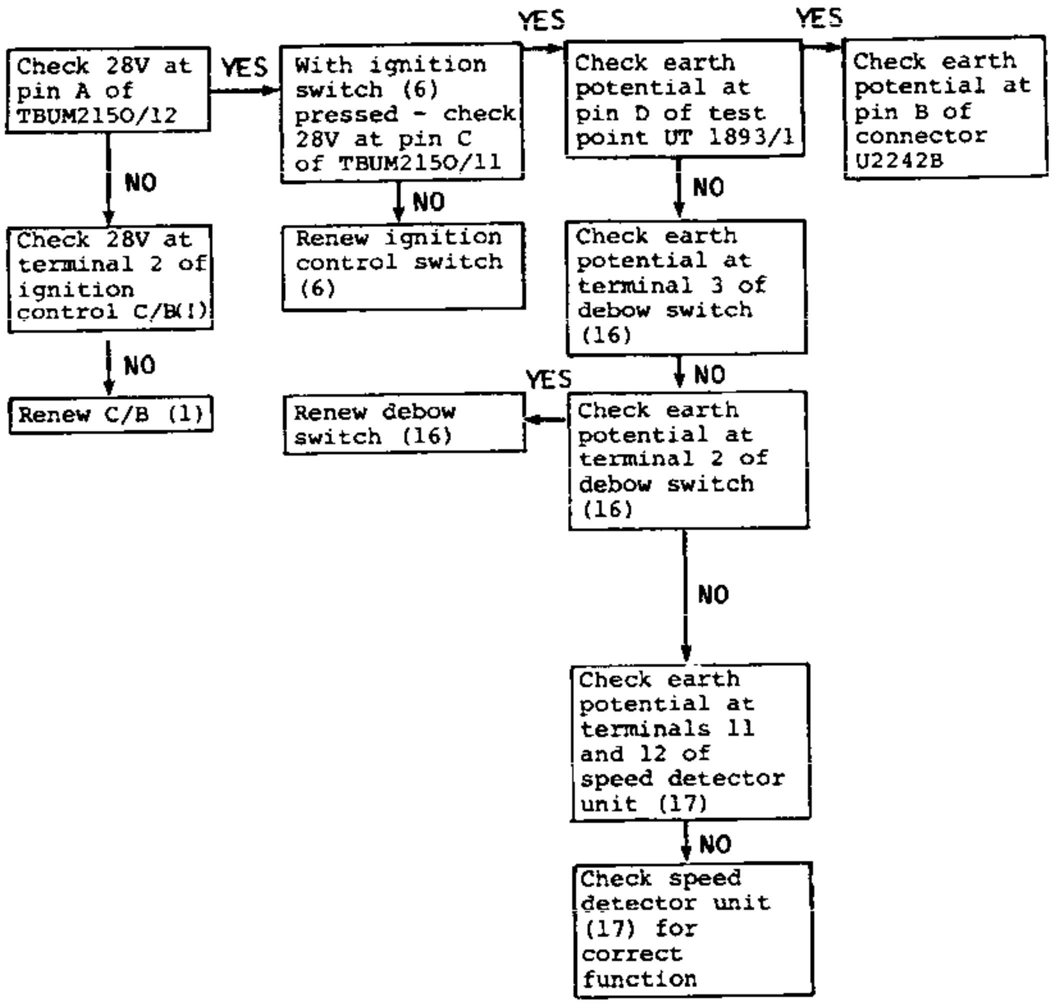

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Chart 103

WITH ENGINE 3 DEBOW SWITCH AT "DEBOW", IGNITION CONTROL SWITCH FAILS TO LATCH IN

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLIES: 200V, 3PH; 28V DC	-
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-

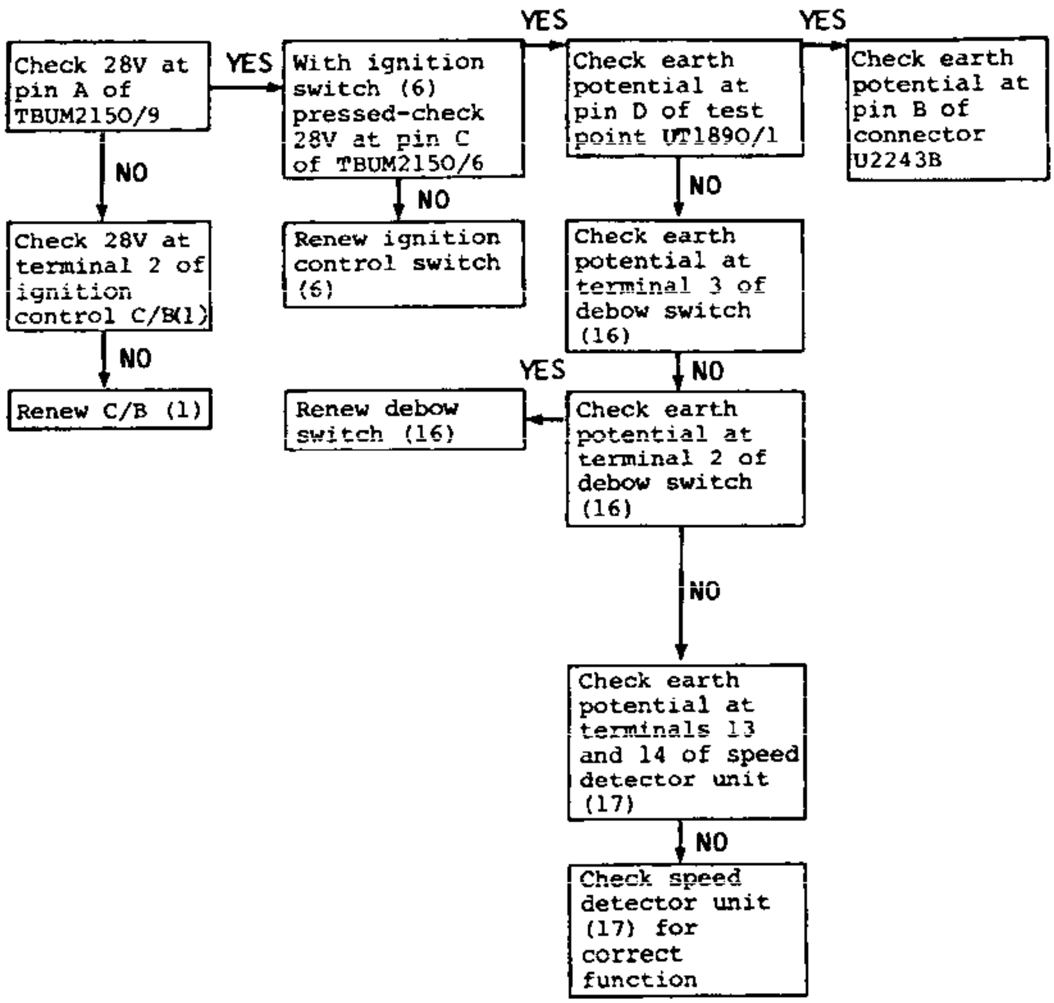

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Chart 104

WITH ENGINE 4 DEBOW SWITCH AT "DEBOW", IGNITION CONTROL SWITCH FAILS TO LATCH IN

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLIES: 200V, 3PH; 28V DC	-
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-

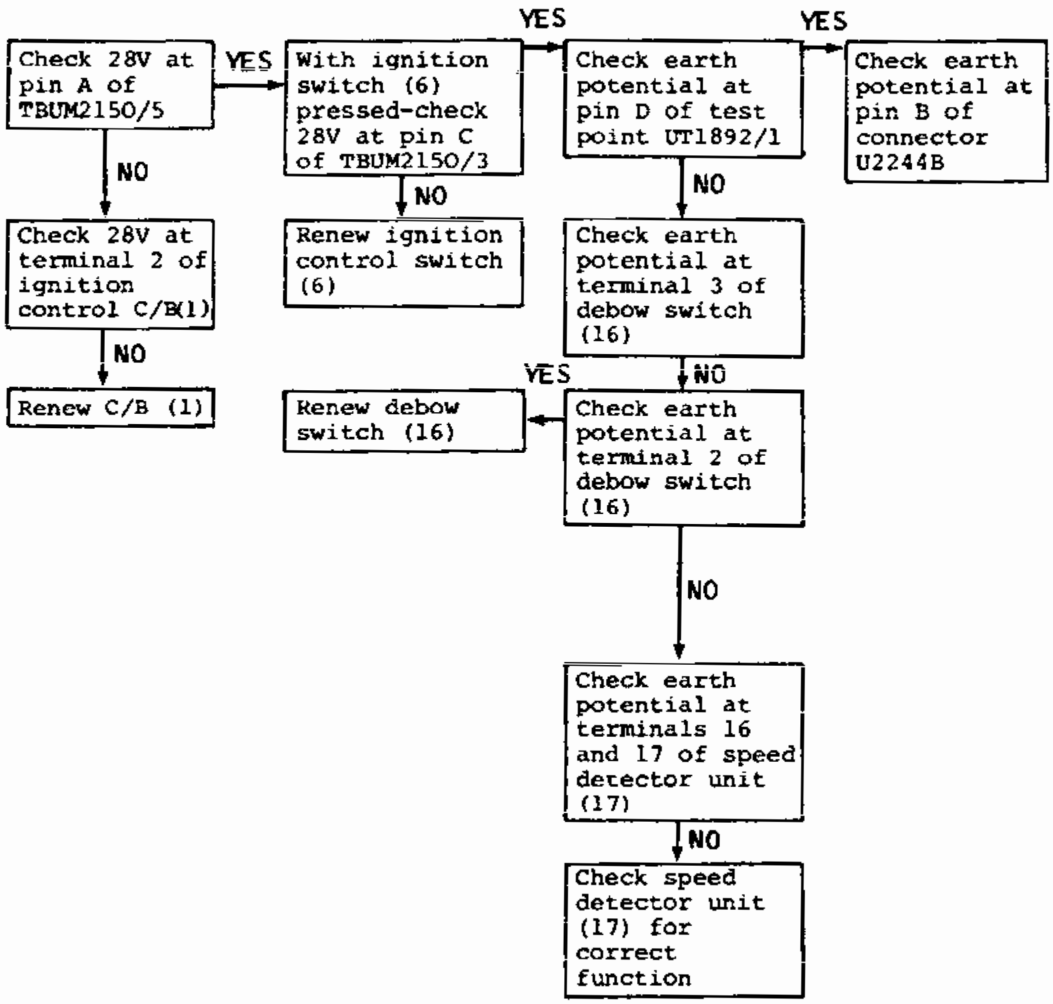

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Chart 105

WITH DEBOW SWITCH AT "DEBOW" AND IGNITION CONTROL SWITCH LATCHED IN - GREEN IGNITION CAPTION FAILS TO ILLUMINATE

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLIES: 200V, 3PH; 28V DC	-
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-

Check earth potential at pin A (RH) or pin C (LH) of T.B. UM1909/13 for engines 1,2 or T.B. UM1909/13 for engines 3,4

YES → Check earth potential at terminal 3 (for engines 1, 2) or terminal 2 (for engines 3,4) of ignition caption unit RH (12) or LH (13)

YES → Check 28 V at terminal 9 of ignition caption unit RH (12) or LH (13)

YES → Renew ignition caption unit RH (12) or LH (13)

NO → Check 28V d.c.at terminal 2 of C/B (3) (of engine 4) for RH caption or C/B (1) (of engine 1) for LH caption

NO → Renew RH caption C/B (3) (of engine 4) or LH caption C/B (1) (of engine 1)

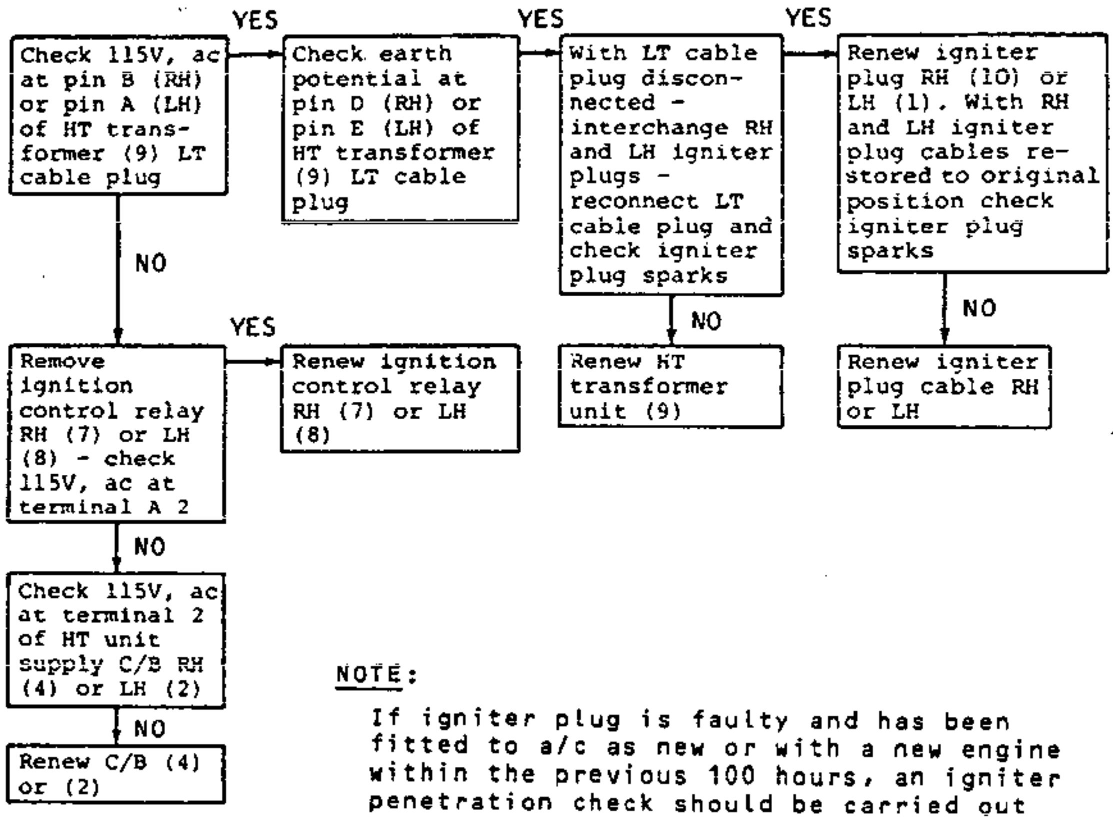
NO (from first check) → Remove ignition control relay RH (7) or LH (8) - check earth potential at terminal B1

YES → Renew ignition control relay RH (7) or LH (8)

Chart 106

IGNITER PLUG FAILS TO SPARK
(DEBOW SWITCH AT "DEBOW")

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLIES:	
200V, 3PH; 28V DC	-
MULTIMETER	-
CIRCUIT BREAKER	
SAFETY CLIPS	-



NOTE:

If igniter plug is faulty and has been fitted to a/c as new or with a new engine within the previous 100 hours, an igniter penetration check should be carried out as per M.M.74-21-02.

A penetration check is also recommended should both igniters 'fail' at the same time.

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R

Chart 107

ENGINE 1 IGNITER PLUG FAILS TO SPARK AND GREEN IGNITION CAPTION FAILS TO ILLUMINATE (DEBOW SWITCH AT "DEBOW")

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLIES: 200V, 3PH; 28V DC	-
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-

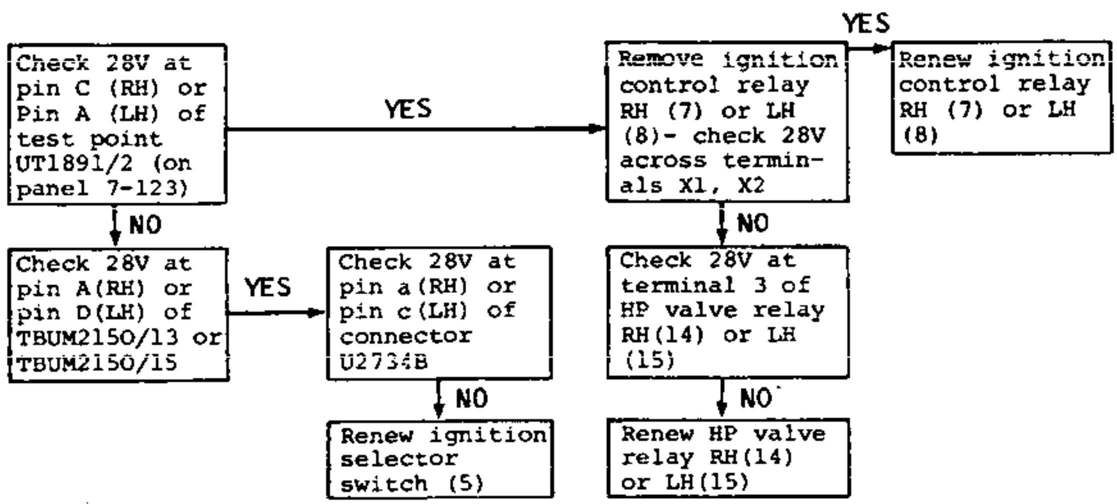

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Chart 108

ENGINE 2 IGNITER PLUG FAILS TO SPARK AND GREEN IGNITION CAPTION FAILS TO ILLUMINATE (DEBOW SWITCH AT "DEBOW")

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLIES: 200V, 3PH; 28V DC	-
MULTIMETER	-
CIRCUIT BREAKER	
SAFETY CLIPS	-

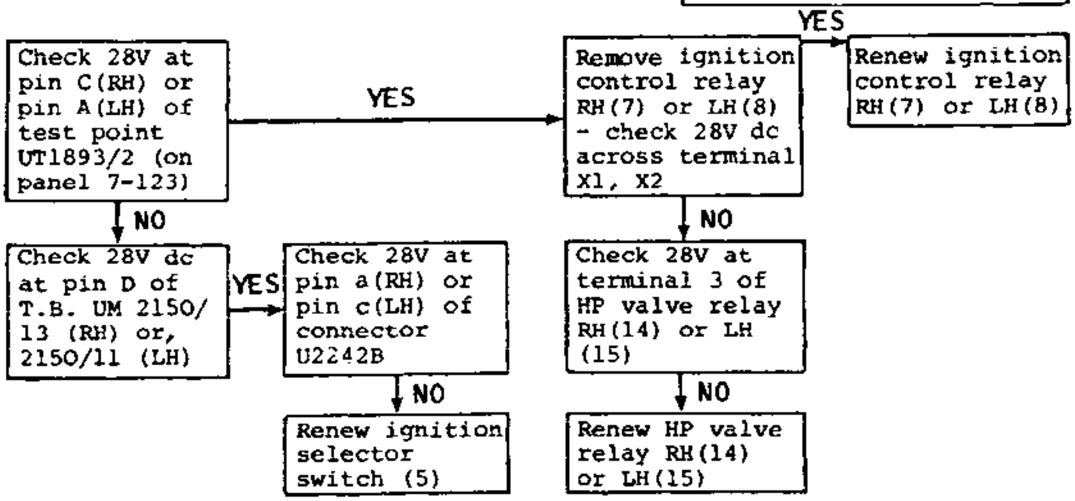

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Chart 109

ENGINE 3 IGNITER PLUG FAILS TO SPARK AND GREEN IGNITION CAPTION FAILS TO ILLUMINATE (DEBOW SWITCH AT "DEBOW")

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLIES: 200V, 3PH; 28V DC	-
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-

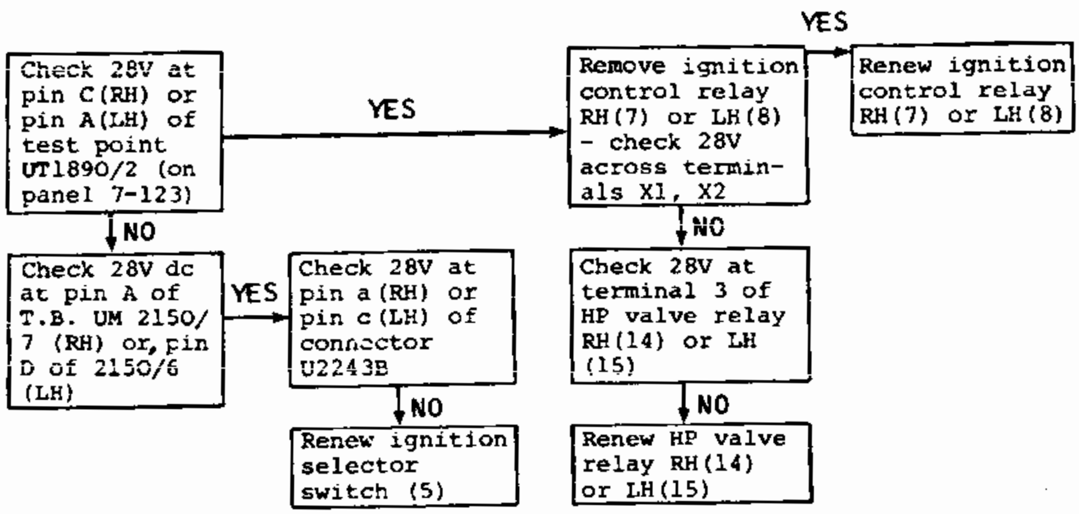

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Chart 110

ENGINE 4 IGNITER PLUG FAILS TO SPARK AND GREEN IGNITION CAPTION FAILS TO ILLUMINATE (DEBOW SWITCH AT "DEBOW")

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLIES: 200V, 3PH; 28V DC	-
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-

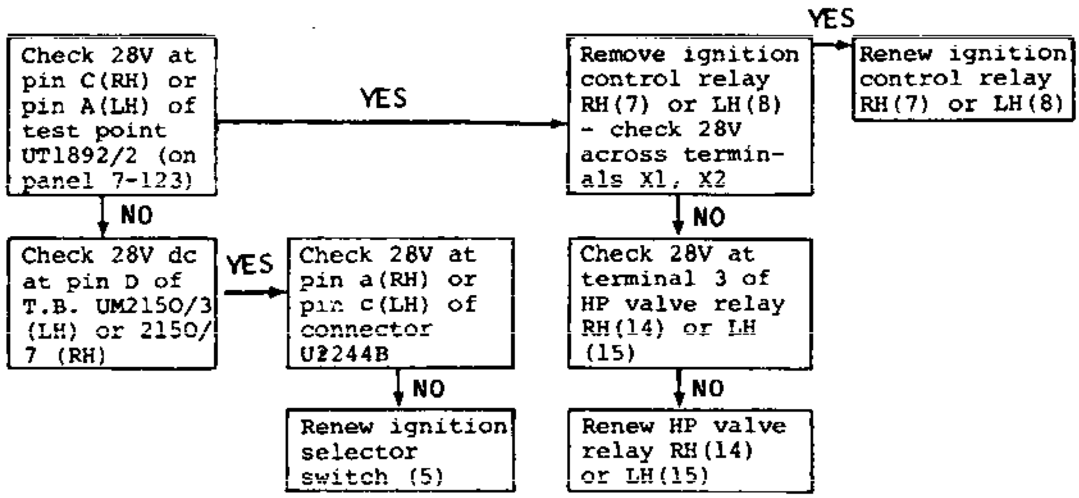

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Chart 111

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
ENGINE No.1						
(1) Circuit breaker 28V d.c.	-	3-213	1J1	E1	24-50-00 R/I	
(2) Circuit breaker 115V, a.c.		2-213	1J3	G10	24-50-00 R/I	
(3) Circuit breaker 28V, d.c.		1-213	1J2	N6	24-50-00 R/I	
(4) Circuit breaker 115V, a.c.		1-213	1J4	N5	24-50-00 R/I	
(5) Ignition selector switch		18-214	J14	3CM		
(6) Ignition control switch		18-214	J5	3CM		
(7) Ignition control relay RH		7-123	1J20	LH misc relay box		
(8) Ignition control relay LH		7-123	1J19	LH misc relay box		
(9) HT trans- former unit		400/415	J23	Engine		
(10) Igniter plug RH		400/415	J24	Engine		
(11) Igniter plug LH		400/415	J25	Engine		
(12) Ignition caption RH		18-214	J17	3CM		
(13) Ignition caption LH		18-214	J16	3CM		
(14) HP valve relay RH		19-213	1K134	LH eng. relay box		
(15) HP valve relay LH		19-213	1K133	LH eng. relay box		
(16) Debow switch		18-214	1K189	3CM		
(17) Speed det- ector unit		1-215	X223	3CM racking		
(-) Terminal block		18-214	UM2150	3CM		
(-) Test point		7-123	UT1891	LH misc relay box		

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
ENGINE No.2						
(1) Circuit breaker 28V, d.c.		3-213	2J1	E2	24-50-00 R/I	
(2) Circuit breaker 115V, a.c.		2-213	2J3	B10	24-50-00 R/I	
(3) Circuit breaker 28V, d.c.		1-213	2J2	P6	24-50-00 R/I	
(4) Circuit breaker 115V, a.c.		1-213	2J4	P5	24-50-00 R/I	
(5) Ignition selector switch		18-214	J14	3CM		
(6) Ignition control switch		18-214	J5	3CM		
(7) Ignition control relay RH		7-123	2J20	LH misc relay box		
(8) Ignition control relay LH		7-123	2J19	LH misc relay box		
(9) HT trans-former unit		400/426	J23	Engine		
(10) Igniter plug RH		400/426	J24	Engine		
(11) Igniter plug LH		400/426	J25	Engine		
(12) Ignition caption RH		18-214	J17	3CM		
(13) Ignition caption LH		18-214	J16	3CM		
(14) HP valve relay RH		19-123	2K134	LH eng. relay box		
(15) HP valve relay LH		19-123	2K133	LH eng. relay box		
(16) Debow switch		18-214	2K189	3CM		
(17) Speed det-ector unit		1-215	X223	3CM racking		
(-) Terminal block		18-214	UM2150	3CM		
(-) Test point		7-123	UT1893	LH misc relay box		

ENGINE No.3

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(1) Circuit breaker 28V, d.c.		3-213	3J1	E3	24-50-00 R/I	
(2) Circuit breaker 115V, a.c.		2-213	3J3	B11	24-50-00 R/I	
(3) Circuit breaker 28V, d.c.		1-213	3J2	Q6	24-50-00 R/I	
(4) Circuit breaker 115V, a.c.		1-213	3J4	Q5	24-50-00 R/I	
(5) Ignition selector switch		18-214	J14	3CM		
(6) Ignition control switch		18-214	J28	3CM		
(7) Ignition control relay RH		8-123	3J20	RH misc relay box		
(8) Ignition control relay LH		8-123	3J19	RH misc relay box		
(9) HT trans- former unit		400/435	J23	Engine		
(10) Igniter plug RH		400/435	J24	Engine		
(11) Igniter plug LH		400/435	J25	Engine		
(12) Ignition caption RH		12-214	J17	3CM		
(13) Ignition caption LH		18-214	J16	3CM		
(14) HP valve relay RH		20-123	3K134	RH eng. relay box		
(15) HP valve relay LH		20-123	3K133	RH eng. relay box		
(16) Debow switch		18-214	3K189	3CM		
(17) Speed det- ector unit		1-215	X223	3CM racking		
(-) Terminal block		18-214	UM2150	3CM		
(-) Test point		8-123	UT1890	RH misc relay box		
ENGINE No.4						
(1) Circuit		3-213	4J1	E4	24-50-00	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
breaker 28V, d.c.					R/I	
(2) Circuit breaker 115V, a.c.		2-213	4J3	G11	24-50-00 R/I	
(3) Circuit breaker 28V, d.c.		1-213	4J2	R6	24-50-00 R/I	
(4) Circuit breaker 115V, a.c.		1-213	4J4	R5	24-50-00 R/I	
(5) Ignition selector switch		18-214	J14	3CM		
(6) Ignition control switch		18-214	J28	3CM		
(7) Ignition control relay RH		8-123	4J20	RH misc relay box		
(8) Ignition control relay LH		8-123	4J19	RH misc relay box		
(9) HT transformer unit		400/446	J23	Engine		
(10) Igniter plug RH		400/446	J24	Engine		
(11) Igniter plug LH		400/446	J25	Engine		
(12) Ignition caption RH		18-214	J17	3CM		
(13) Ignition caption LH		18-214	J16	3CM		
(14) HP valve relay RH		20-123	4K134	RH eng. relay box		
(15) HP valve relay LH		20-123	4K133	RH eng. relay box		
(16) Debow switch		18-214	4J189	3CM		
(17) Speed detector unit		1-215	X223	3CM racking		

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(-) Terminal block		18-214	UM2150	3CM		
(-) Test point		8-123	UT1892	RH misc relay box		

Component Identification
Table 101

ENGINE INTERNAL OVERHEAT - TROUBLE SHOOTING

1. General

A. The ENGINE O/HEAT caption, Master Warning System and engine shut-down lights can be actuated by:

Engine internal overheat via the vent thermocouples;
R ref. para.1.C.
Aircraft wiring defect in any of the above systems.

R B. Visual indications to determine the system(s) triggering the defect are displayed by annunciator lights on the front face of the turbine cooling air and bearing vent
R overheat amplifier. After an engine overheat warning,
R before the system is disturbed, the annunciator lights
R should be read and any lights illuminated should be
R recorded (Ref. Paragraph E. and Table 101).

R C. Under normal operating conditions, the margin between operating temperatures and warning settings of the turbine cooling air and bearing vent air overheat amplifier are at their minimum at the following conditions and a drift of warning settings or deterioration of air cooling would identify themselves firstly at these conditions:

LP and HP compressor thrust bearing cold vents	-	Climb/Accel Mach 1.0-1.5
HP and LP turbine cold vent	-	Climb/Accel Mach 1.0-1.5
HP compressor rear labyrinth seal hot vent	-	Accel above Mach 1.5-2.0
LP turbine bearing hot vent	-	Mach 1.0

R D. Engine malfunction causing overheat by hot air ingress without fire can occur in any of the above systems. If the HP compressor rear labyrinth seal hot vent or LP turbine bearing cold vent systems give rise to a genuine warning it is possible that hot gas from combustion chamber or exhaust gas is entering the vent zones. Evidence of oil discharge from hot vents must be interpreted as a potential fire hazard and indicates malfunction. Oiliness of cold vents without other symptoms is not considered a hazard.

E. Prior to investigating any indicated defect the integrity of the annunciator light must be checked in order to isolate an electrical fault within the amplifier.

Single fault defects which may be related to multiple annunciator light indications (including the turbine cooling air failure indication) are given in the following table.

Annunciator Light Indication: Turbine Cooling Air and Bearing Vent O/H Amplifier — Channel 1 HP Turbine Disk	Channel 2 Nos. 2 and 3 Bearing Vent	Channel 3 Nos. 4 and 5 Bearing Vent	Channel 4 No.12G Labyrinth Hot Vent	Channel 5 No.5 Bearing Hot Vent	Remarks In Respect of Indication Combinations
*		*			Possibility of a major failure around the HP turbine bearing, and probably accompanied by other symptoms and evidence.
*			*		
*		*	*		
	*			*	Possibility of serious internal local engine fault.
		*	*		Possibility of fault in HP turbine bearing zone.
		*		*	Possibility of fault in LP turbine bearing zone. Either of these lights alone has the same possibility.

R Annunciator Light Trouble Shooting
R Table 101

F. A diode in the engine overheat system prevents a feedback occurring from the system signalling the defect. A short circuit of the diode could result in the annunciator light being illuminated on more than one system. It should however be noted that simultaneous faults in more than one system could result in more than one annunciator light being illuminated.

G. Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is
R detailed in Table 102.

2. Preparation

A. Ensure that external electrical power supply is connected and switched on.

B. Determine which system is triggering the defect. Check if the turbine cooling and bearing vent air overheat amplifier annunciator lights 2, 3, 4 or 5 are illuminated. If illuminated refer to Table 102.

CR 32521/008

ENGINE INTERNAL OVERHEAT TROUBLE SHOOTING

CHART INDEX

FAULTS ASSOCIATED WITH ENGINE INT O'HEAT. OR ENGINE FIRE AND O'HEAT TEST SUPPLY CIRCUIT BREAKERS FAILING TO 'HOLD IN'

ENG INT O'HEAT IND CIRCUIT BREAKER (1) FAILS TO 'HOLD IN'. REFER TO CHART NO.102

ENG FIRE AND O'HEAT TEST SUP CIRCUIT BREAKER (2) FAILS TO 'HOLD IN'. REFER TO CHART NO.103

FAULTS ASSOCIATED WITH PRE-FLIGHT CHECK-OUT OF ENGINE INTERNAL OVERHEAT INSTRUMENTATION USING TEST SWITCH

ENGINE O'HEAT, MASTER WARNING AND ENGINE SHUT DOWN HANDLE WARNING LIGHTS FAIL TO ILLUMINATE WHEN TEST IS SELECTED ON A SPECIFIC CHANNEL. REFER TO CHART NO.104

NOTE:- TO FUNCTIONALLY CHECK THE SYSTEM IT IS NECESSARY TO RUN THE ENGINE. REFER TO ENGINE RUNNING PROCEDURES AND CHECKS IN MAINTENANCE MANUAL

WARNING LIGHTS FAIL TO ILLUMINATE WHEN T.C.A. OR CHANNELS 'A', 'B', 'C', OR 'D' IS SELECTED TO TEST. REFER TO CHART NO.105

CMR 71 00 31 1 AAMO

FAULTS ASSOCIATED WITH NORMAL ENGINE OPERATION

ENGINE O'HEAT, MASTER WARNING AND ENGINE SHUT DOWN HANDLE WARNING LIGHTS ILLUMINATED. REFER TO CHART NO.106

R

Chart 101

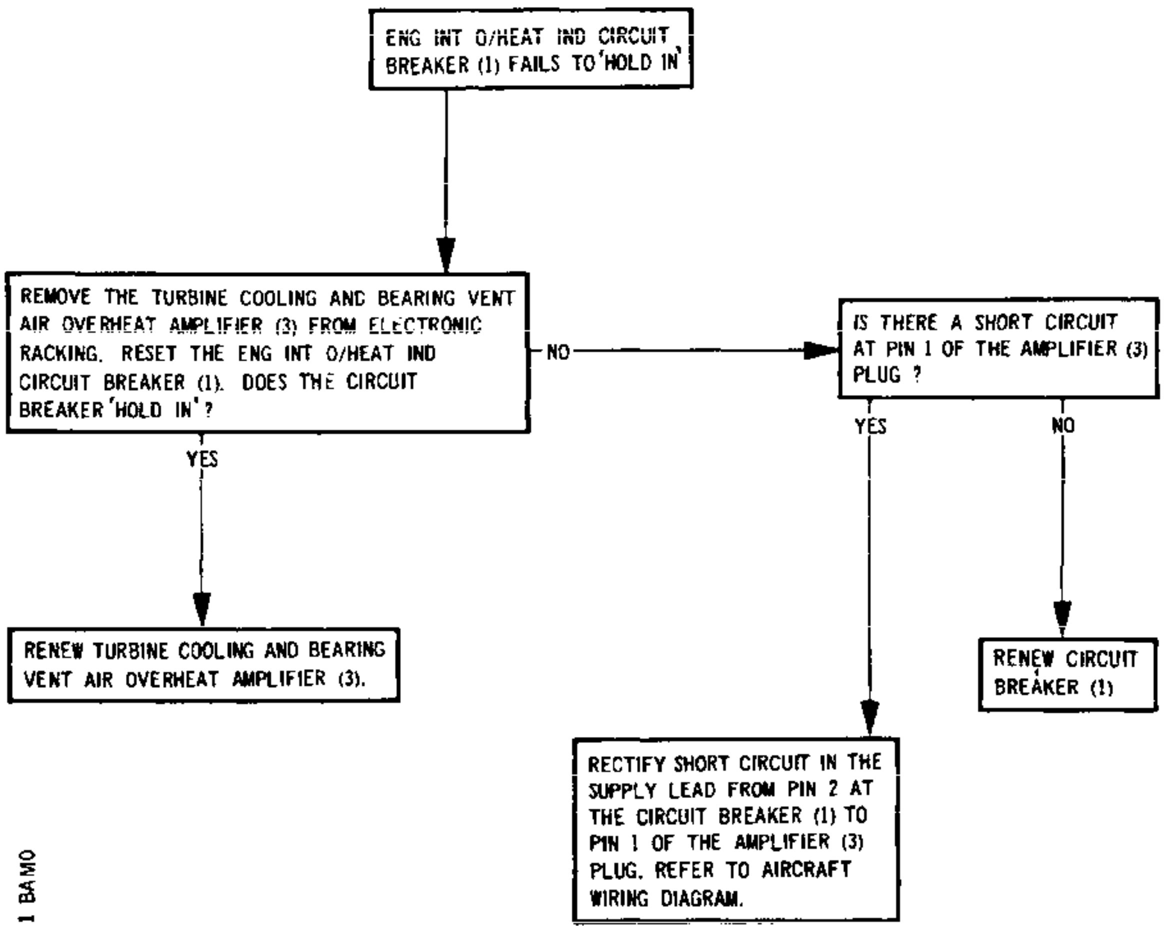
CR 32522/00A

GROUND EQUIPMENT

DESCRIPTION

GROUND POWER SUPPLY (115 V a.c.)

MULTI-TEST METER

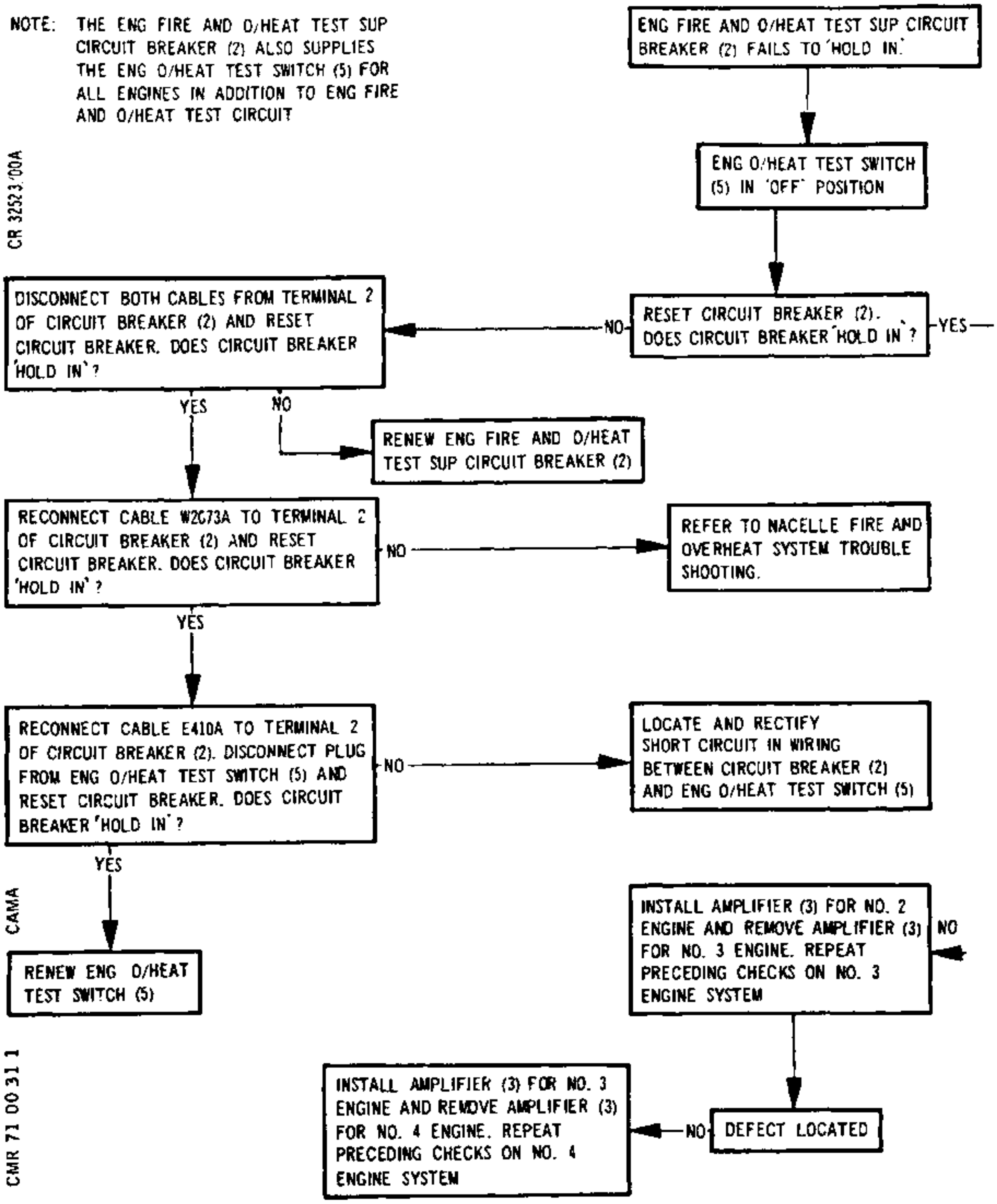


CMR 71 00 31 1 BAMO

Chart 102

Printed in England

NOTE: THE ENG FIRE AND O/HEAT TEST SUP CIRCUIT BREAKER (2) ALSO SUPPLIES THE ENG O/HEAT TEST SWITCH (5) FOR ALL ENGINES IN ADDITION TO ENG FIRE AND O/HEAT TEST CIRCUIT



CR 3252/00A

CAMA

CMR 71 00 31 1

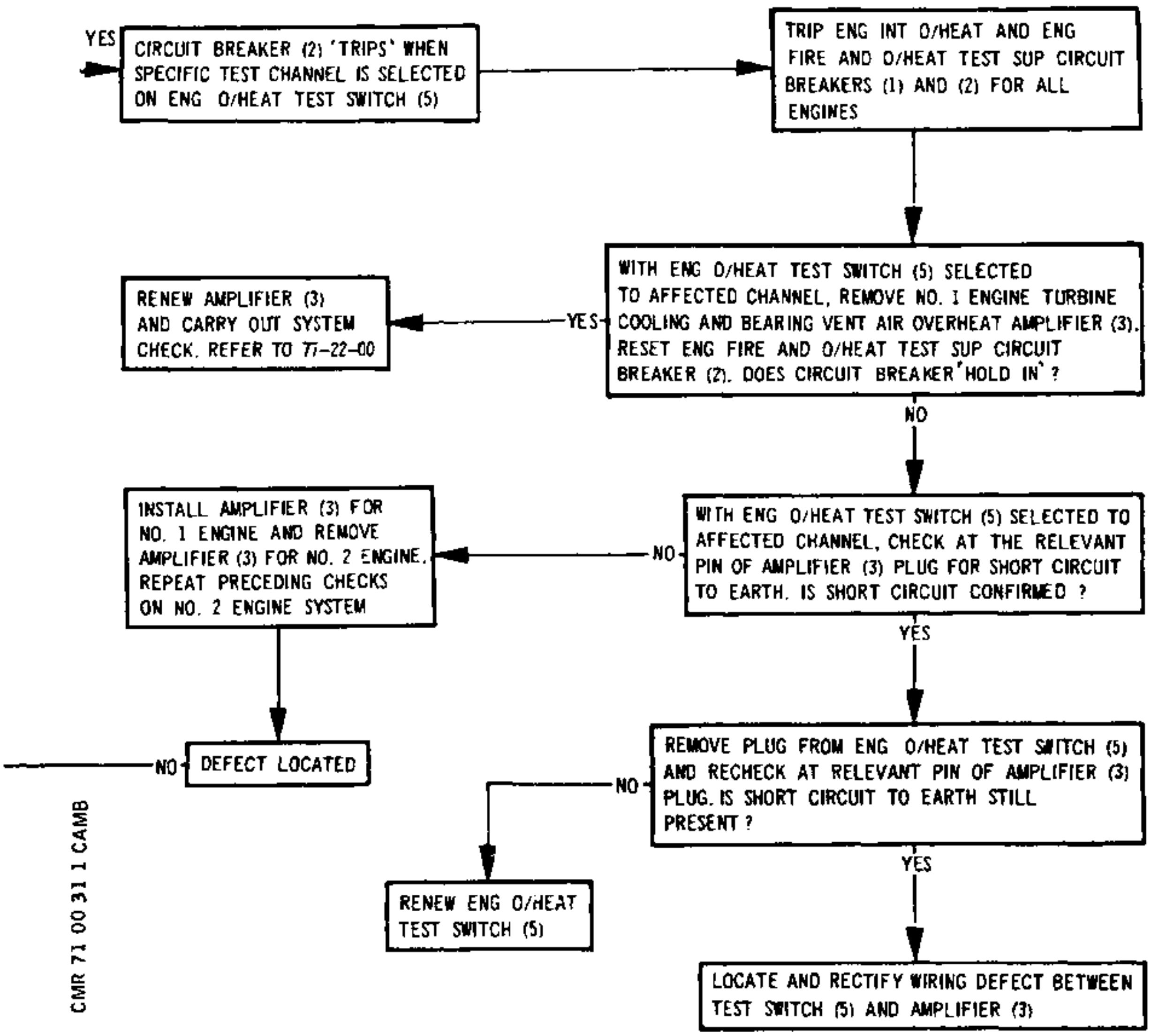
Chart 103 (Sheet 1 of 2)

CR 32524 00A

GROUND EQUIPMENT

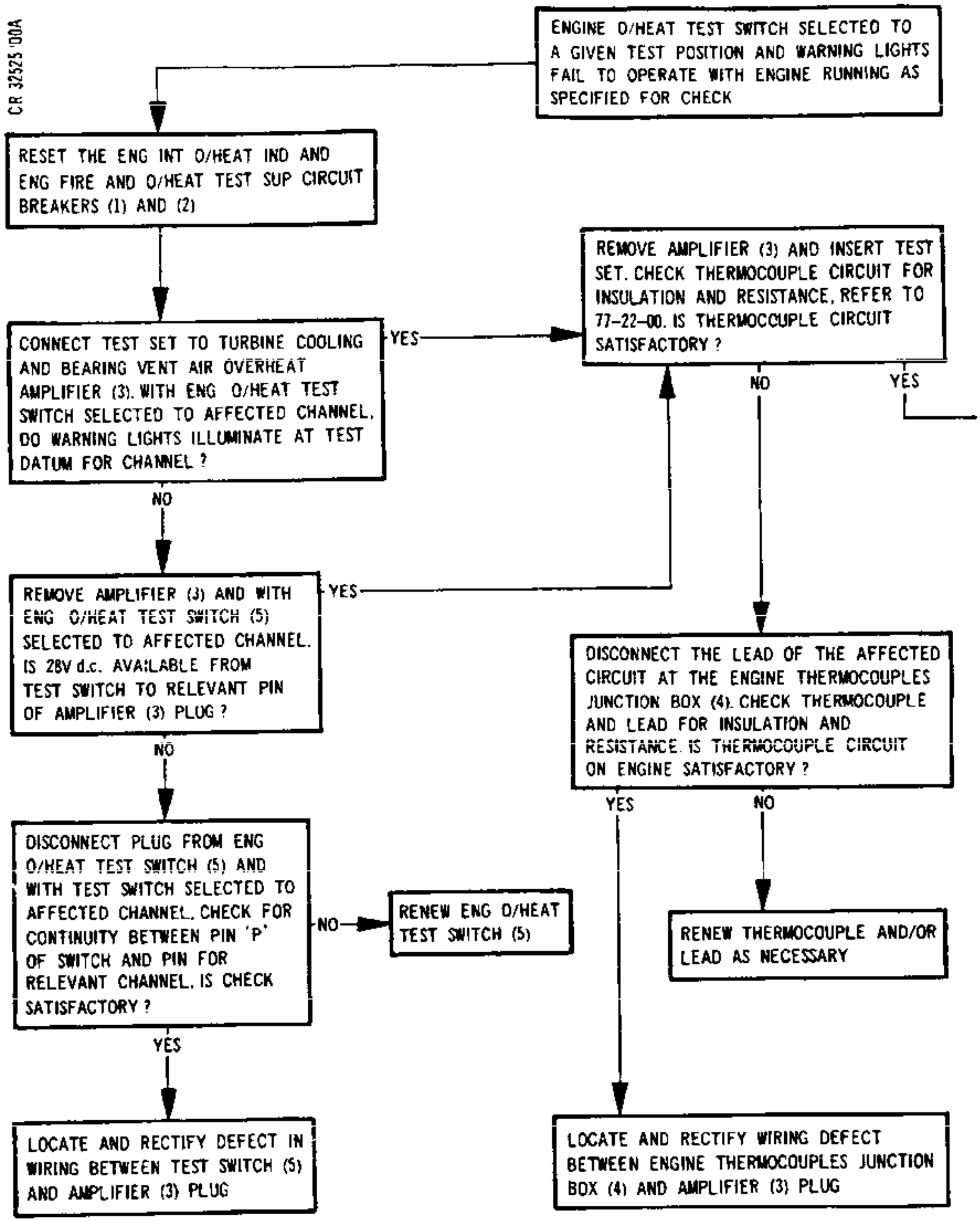
DESCRIPTION

GROUND POWER SUPPLY (28 V d.c.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 31 1 CAMB

Chart 103 (Sheet 2 of 2)



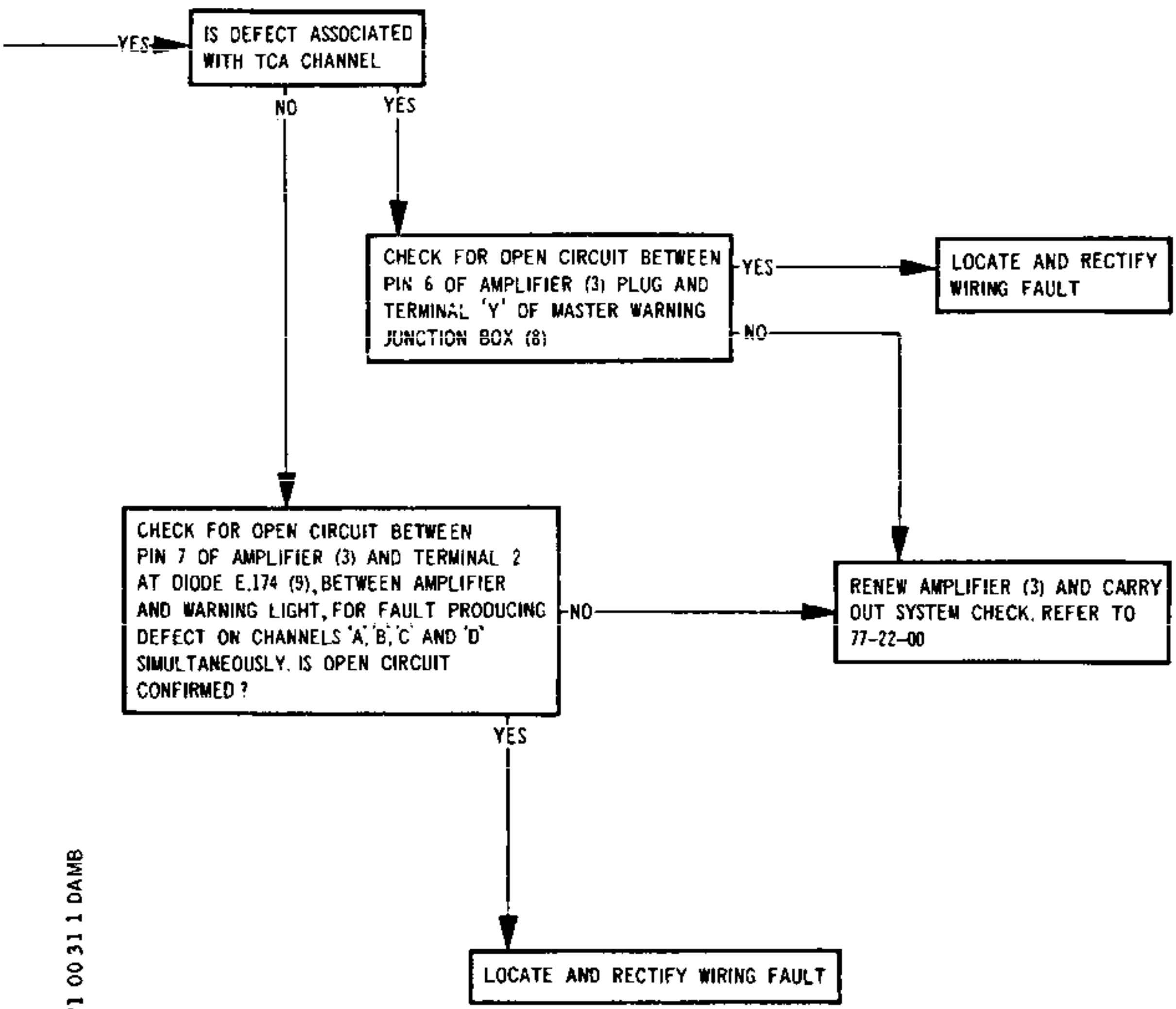
CR 32525 00A

CMR 71 00 31 1 0AMA

Chart 104 (Sheet 1 of 2)

CR 32526 00A

GROUND EQUIPMENT
REFER TO CHART NO. 105



CMR 71 00 31 1 DAMB

Chart 104 (Sheet 2 of 2)

GROUND EQUIPMENT
DESCRIPTION

GROUND POWER SUPPLY (115 V a.c. 400 HZ)
GROUND POWER SUPPLY (28 V d.c.)
TEST SET AND CABLES PE.19650
D.C. GALVANOMETER POTENTIOMETER OR DIGITAL VOLTMETER 0 TO 50 mV ACCURACY ± 0.01 mV
MULTI-TEST METER OR RESISTANCE METER 0 TO 1000 ohms
D.C. VOLTMETER 0 TO 5V
CIRCUIT BREAKER SAFETY CLIPS

ENGINE OVERHEAT TEST SWITCH SELECTED TO TCA, 'A', 'B', 'C' AND 'D' POSITIONS AND WARNING LIGHTS FAIL TO ILLUMINATE WITH ENGINE RUNNING AS SPECIFIED FOR CHECK.

RESET THE ENG INT O/HEAT IND AND ENG FIRE AND O/HEAT TEST SUP CIRCUIT BREAKERS (1) AND (2)

CHECK POWER SUPPLY AT TURBINE COOLING AND BEARING VENT AIR OVERHEAT AMPLIFIER (3) BY OPERATING ANNUNCIATOR LIGHT 'PRESS TO TEST.' DO ANNUNCIATOR LIGHTS ILLUMINATE ?

YES

CONNECT TEST SET TO AMPLIFIER (3). WITH ENG O/HEAT TEST SWITCH (5) SELECTED 'OFF.' CHECK THAT WARNINGS OPERATE AT SPECIFIED DATUMS. REFER TO 77-22-00

NO

NO

YES

REMOVE AMPLIFIER (3) IS 115 V a.c. SUPPLY AVAILABLE AT PIN 1 AND ARE PINS 2 AND 13 OF AMPLIFIER PLUG TO EARTH ?

YES

RENEW AMPLIFIER (3) AND CARRY OUT SYSTEM CHECK. REFER TO 77-22-00

IS 28 V d.c. SUPPLY AVAILABLE AT PIN 'P' OF ENG O/HEAT TEST SWITCH (5) PLUG ?

NO

YES

NO

LOCATE AND RECTIFY OPEN CIRCUIT BETWEEN TERMINAL 1 OF CIRCUIT BREAKER (1) AND PIN 1 OF AMPLIFIER PLUG OR OPEN CIRCUIT BETWEEN PINS 2 AND 13 OF AMPLIFIER PLUG TO EARTH

AT ENG O/HEAT TEST SWITCH (5) PLUG CHECK CONTINUITY BETWEEN PIN 'P' AND PINS 'D', 'E', 'F', 'G' AND 'H' WITH THE TEST SWITCH SELECTED TO CHANNEL BEING CHECKED. DOES OPEN CIRCUIT EXIST ?

YES

RENEW ENG O/HEAT TEST SWITCH (5)

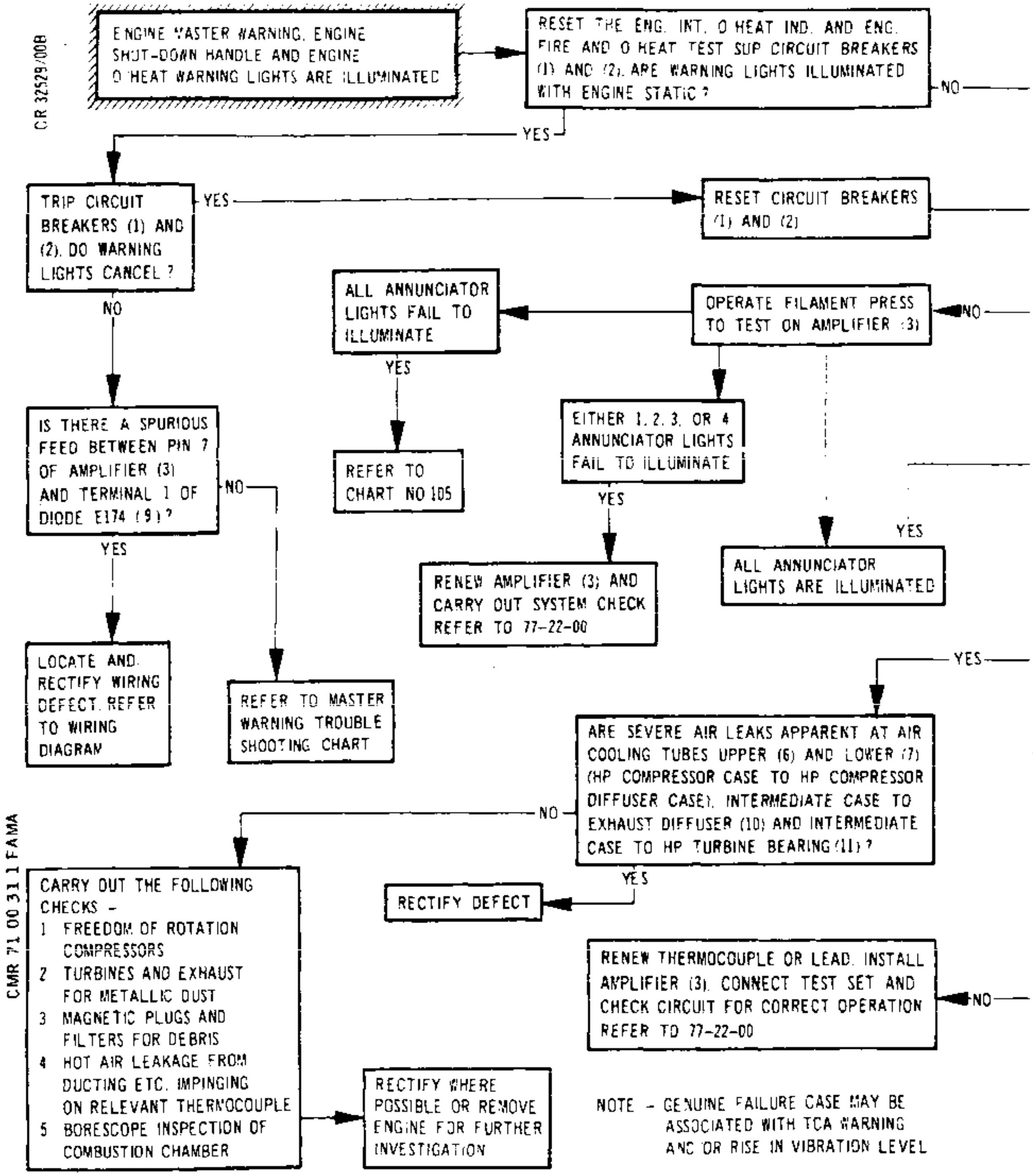
LOCATE AND RECTIFY OPEN CIRCUIT BETWEEN PIN 1 OF CIRCUIT BREAKER (2) AND PIN 'P' OF ENG O/HEAT TEST SWITCH (5). THIS DEFECT WILL AFFECT ALL ENGINES.

CR 32527 00A

EAM0

CMR 71 00 31 1

Chart 105



R

Chart 106 (Sheet 1 of 2)

R

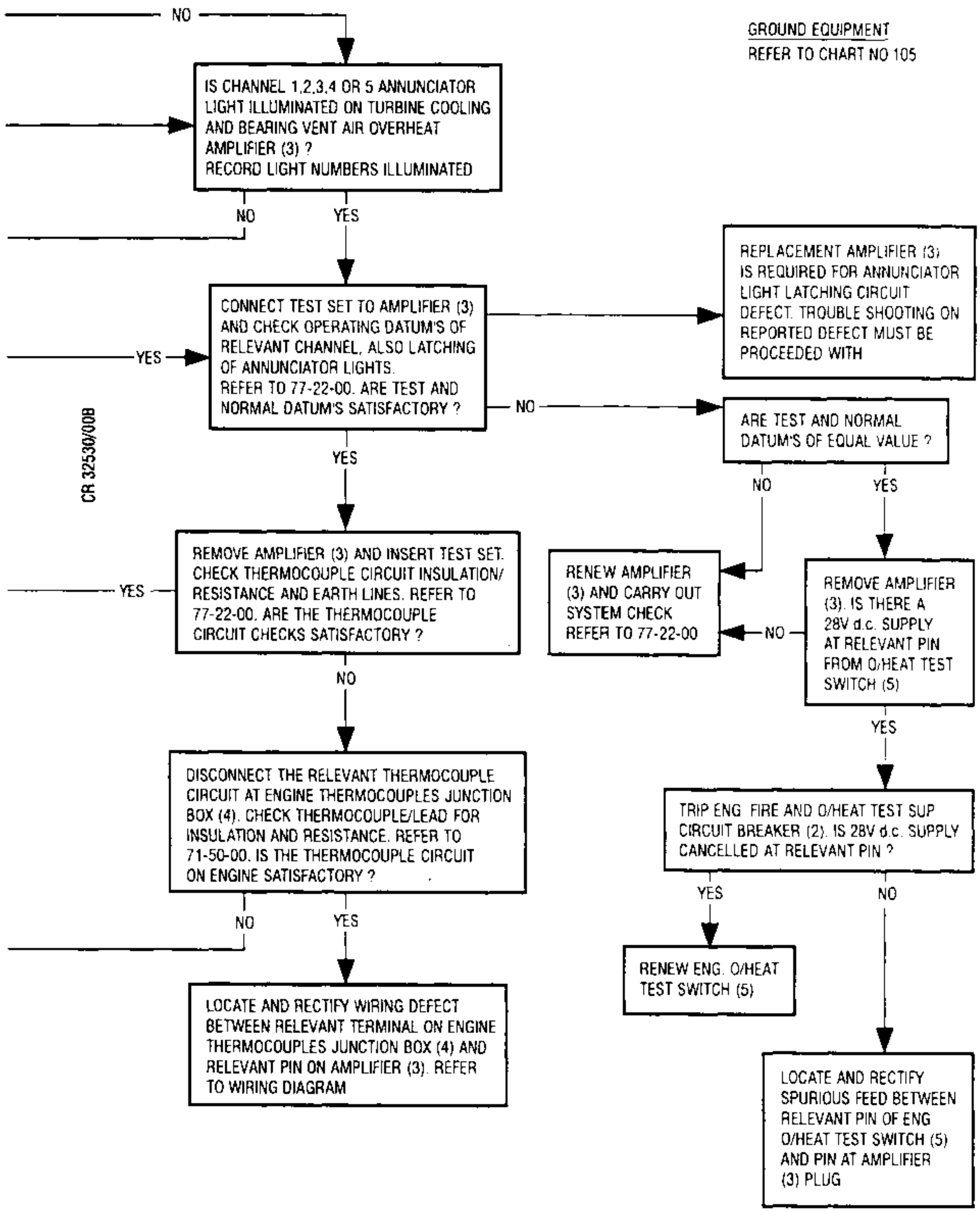


Chart 106 (Sheet 2 of 2)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1						
(1) Circuit breaker 115 V	-	4-213	1E171	Map Ref. E18		
(2) Circuit breaker 28 V	-	15-215	W431	Map Ref. B1		
(3) Turbine cooling and bearing vent air overheat amplifier	-	2-215	1E173	-	77-22-11	
(4) Engine thermocouples junction box	-	416	-	-	77-22-08	
(5) Eng. O/Heat test switch	-	27-214	E172	-	77-00-00	
(6) Air cooling tubes (upper), HP compressor case to HP compressor diffuser case	-	415/416	-	-	75-01-03	
(7) Air cooling tubes (lower), HP compressor case to HP compressor diffuser case	-	416	-	-	75-01-04	
(8) Master warning junction box	-	7-216	US216-07	-	-	
(9) Diode E174	-	1-214	1E174	-	-	
(10) Air cooling tubes, intermediate case to exhaust diffuser	-	416	-	-	75-01-01	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(11) Air cooling tubes, intermediate case to HP turbine bearing	-	416	-	-	75-01-02	
ENGINE NO.2						
(1) Circuit breaker 115 V	-	4-213	2E171	Map Ref. B18		
(2) Circuit breaker 28 V	-	15-215	W431	Map Ref. B1		
(3) Turbine cooling and bearing vent air overheat amplifier	-	1-215	2E173	-	77-22-11	
(4) Engine thermocouples junction box	-	426	-	-	77-22-08	
(5) Eng. O/Heat test switch	-	27-214	E172	-	77-00-00	
(6) Air cooling tubes (upper), HP compressor case to HP compressor diffuser case	-	425/426	-	-	75-01-03	
(7) Air cooling tubes (lower), HP compressor case to HP compressor diffuser case	-	426	-	-	75-01-04	
(8) Mastering junction box	-	7-216	US216-07	-	-	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(9) Diode E174	-	1-214	2E174	-	-	
(10) Air cooling tubes, intermediate case to exhaust diffuser	-	426	-	-	75-01-01	
(11) Air cooling tubes, intermediate case to HP turbine bearing	-	426	-	-	75-01-02	
<u>ENGINE NO.3</u>						
(1) Circuit breaker 115 V	-	4-213	3E171	Map Ref. B19		
(2) Circuit breaker 28 V	-	15-215	W431	Map Ref. B1		
(3) Turbine cooling and bearing vent air overheat amplifier	-	1-216	3E173	-	77-22-11	
(4) Engine thermocouples junction box	-	436	-	-	77-22-08	
(5) Eng. O/Heat test switch	-	27-214	E172	-	77-00-00	
(6) Air cooling tubes (upper), HP compressor case to HP compressor diffuser case	-	435/436	-	-	75-01-03	
(7) Air cooling tubes (lower), HP compressor	-	436	-	-	75-01-04	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
case to HP compressor diffuser case						
(8) Master warning junction box	-	7-216	US216-07	-	-	
(9) Diode E174	-	1-214	3E174	-	-	
(10) Air cooling tubes, intermediate case to exhaust diffuser	-	436	-	-	75-01-01	
(11) Air cooling tubes, intermediate case to HP turbine bearing	-	436	-	-	75-01-02	
ENGINE NO.4						
(1) Circuit breaker 115 V	-	4-213	4E171	Map Ref. E19		
(2) Circuit breaker 28 V	-	15-215	W431	Map Ref. B1		
(3) Turbine cooling and bearing vent air overheat amplifier	-	2-216	4E173	-	77-22-11	
(4) Engine thermocouples junction box	-	446	-	-	77-22-08	
(5) Eng. O/Heat test switch	-	27-214	E172	-	77-00-00	
(6) Air cooling tubes (upper), HP	-	445/446	-	-	75-01-03	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
compressor case to HP compressor diffuser case						
(7) Air cooling tubes (lower), HP compressor case to HP compressor diffuser case	-	446	-	-	75-01-04	
(8) Master warning junction box	-	7-216	US216-07	-	-	
(9) Diode E174	-	1-214	4E174	-	-	
(10) Air cooling tubes, intermediate case to exhaust diffuser	-	446	-	-	75-01-01	
(11) Air cooling tubes, intermediate case to HP turbine bearing	-	446	-	-	75-01-02	

R

Component Identification
Table 102 (Concluded)

FUEL FLOW INDICATION - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. para.3.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

Where identical components are involved, i.e., one in each circuit, all references to the associated components listed in Table 101 are given, e.g., 'Renew CB (2), (3), (4) or (5)'.

Abbreviations used throughout the Charts are:-

FC = Fuel Consumed
FFR = Fuel Flow Rate
TFR = Total Fuel Remaining

2. Preparation

A. Ensure that the associated circuit breakers are set (Ref. Table 101).

B. Make available electrical ground power as detailed in 24-41-00.

C. Remove the sealing cover from shelf 1-216 in the flight compartment RH racking, aft.

D. Test the integral lighting and warning lights (Ref. 33-17-00 and 33-14-00).

3. Trouble Shooting

```
A.*****************************************
  *Prepare to trouble shoot (Ref. para.2.).*
  *Check that only the centre bars are     *
  *displayed on the TFR and FC indicators  *
  *when power is first switched on.  IF -  *
  *****************************************
              |    |
              |    |             ----------------------------------
              |    |            |Centre bars not displayed, or     |
             OK   NOT OK-------|reading other than centre bars    |
              |                 |displayed, on the TFR and FC      |
              |                 |indicators when power is first    |
              |                 |switched on - Chart 101.          |
              |                  ----------------------------------
              |
B.*****************************************
  *Check that, if the main and reheat warn-*
  *ing lights on any of the FC indicators  *
  *come on, they go out within 10 s.  IF - *
  *****************************************
              |    |
              |    |             ----------------------------------
              |    |            |Main and/or reheat warning lights |
             OK   NOT OK-------|come on and do not go out within  |
              |                 |10 s when power is first switched |
              |                 |on - Chart 102.                   |
              |                  ----------------------------------
              |
C.*****************************************
  *Check that the warning flag on each FFR *
  *indicator has cleared from view. IF -   *
  *****************************************
              |    |
              |    |             ----------------------------------
              |    |            |Power failure warning flag remains|
             OK   NOT OK-------|in view on FFR indicator with     |
              |                 |power on - Chart 103.             |
              |                  ----------------------------------
              |
D.*****************************************
  *Check that all FFR indicators are       *
  *reading zero.                           *
  *****************************************
              |    |
```

```
             |     |          -----------------------------------
             |     |         |FFR indicators do not read zero    |
             OK    NOT OK-------|when power is switched on -     |
             |               |Chart 104.                         |
             |                -----------------------------------
             |
E.*******************************************
  *With the right reset knob at 'N', check *
  *that when the left reset knob is pressed*
  *and held, all the digits on the TFR     *
  *indicator display figure eight.  IF -   *
  *******************************************
             |     |
             |     |          -----------------------------------
             |     |         |With right reset knob at 'N', when|
             OK    NOT OK-------|left reset knob is pressed and  |
             |               |held, digits on TFR indicator do  |
             |               |not display figure eight - Chart  |
             |               |105.                               |
             |                -----------------------------------
             |
F.*******************************************
  *When the left reset knob is released,   *
  *check that the TFR and the FC indicators*
  *display a reading other than centre     *
  *bars.  IF -                             *
  *******************************************
             |     |
             |     |          -----------------------------------
             |     |         |TFR and FC indicators show centre |
             OK    NOT OK=======|bars when left reset knob on TFR |
             |               |indicator is released - Chart 106.|
             |                -----------------------------------
             |
G.*******************************************
  *Check that the FC indicator digits      *
  *display figure eights when the assoc-   *
  *iated reset knob is operated.  IF -     *
  *******************************************
             |     |
             |     |          -----------------------------------
             |     |         |Renew FC Indicator(s) (7), (8),   |
             OK    NOT OK-------|(9) or (10) not reading all eights|
             |               |when the reset knob is turned     |
             |               |clockwise.                         |
             |                -----------------------------------
             |
```

```
             |
H.*******************************************
  *Check that the main and reheat warning  *
  *lights come on when the reset knob is   *
  *released.  IF -                         *
  *******************************************
             |    |
             |    |                ----------------------------------
             |    |               |Main and/or reheat warning lights |
            OK   NOT OK-----------|do not come on when associated    |
             |                    |reset knob on FC indicator is     |
             |                    |released after turning clockwise. |
             |                    |- Chart 107.                      |
             |                    |NOTE: This test could be incon-   |
             |                    |      clusive without engines     |
             |                    |      running (Ref. 73-33-00,     |
             |                    |      Adjustment/Test).           |
             |                     ----------------------------------
             |
I.*******************************************
  *Check that the main and reheat warning  *
  *lights go out within 10 s of the reset  *
  *knob being released.  IF -              *
  *******************************************
             |    |
             |    |                ----------------------------------
             |    |               |Main and/or reheat warning lights |
            OK   NOT OK-----------|do not go out within 10 s of FC   |
             |                    |indicator reset knob being        |
             |                    |released after it is turned clock-|
             |                    |wise - suspect associated Trans-  |
             |                    |mitter (15),(16),(17),(18),(19),  |
             |                    |(20),(21) or (22). Before renewing|
             |                    |the suspected transmitter, perform|
             |                    |a proof run of the unit by operat-|
             |                    |ing the appropriate engine (Ref.  |
             |                    |73-33-00, Adjustment/Test).       |
             |                     ----------------------------------
             |
J.*******************************************
  *Check that the FC indicator readings    *
  *return to the noted values when the     *
  *reset knob is released.  IF -           *
  *******************************************
             |    |
             |    |                ----------------------------------
             |    |               |FC indicator reading does not     |
            OK   NOT OK-----------|return to the value noted before  |
             |                    |the operation of the reset knob - |
             |                    |renew FC Indicator (7),(8),(9) or |
             |                    |(10).                             |
```

```
                |
K.*******************************************
   *Check that the aircraft weight and fuel *
   *load on the TFR indicator can be set    *
   *satisfactorily, and that the setting    *
   *error correction test is satisfactory.  *
   *IF -                                    *
   *******************************************
                |    |
                |    |               ----------------------------------
                |    |              |Aircraft weight and fuel load     |
               OK   NOT OK----------|fails to set correctly - renew TFR|
                |                   |Indicator (6).                    |
                |                    ----------------------------------
                |
L.*******************************************
   *Check that the FC indicators can be set *
   *to zero, i.e., three blanks and one zero*
   *in the least significant digit. IF -    *
   *******************************************
                |    |
                |    |               ----------------------------------
                |    |              |FC indicators cannot be set to    |
               OK   NOT OK----------|zero using the reset knob - renew |
                |                   |FC Indicator (7),(8),(9) or (10). |
                |                    ----------------------------------
                |
M.*******************************************
   *Check that, when the COUNT switch is    *
   *held on, all FFR indicators read between*
   *27 and 33 and the mode flags read FT.   *
   *Hold the switch on for exactly 36 s     *
   *and note the FFR indicator readings.    *
   *IF -                                    *
   *******************************************
                |    |
                |    |               ----------------------------------
                |    |              |FFR indicators do not read between|
               OK   NOT OK----------|27 and 33 when the COUNT switch   |
                |                   |is operated - Chart 108.          |
                |                    ----------------------------------
                |
```

```
                |
N.*******************************************
  *When the COUNT switch is released after *
  *36 s, check that the FC indicators read *
  *the same count as noted in paragraph M.,*
  *above.                                  *
  ******************************************
                |    |
                |    |                  ----------------------------------
                |    |                 |1. FC indicators do not read      |
               OK   NOT OK-------|   correctly when the COUNT switch|
                |                      |   is released after 36 s - Chart |
                |                      |   109.                           |
                |                      |2. A discrepancy of more than one |
                |                      |   significant digit is shown     |
                |                      |   between the four FC indicators |
                |                      |   - renew Indicator (7),(8),(9)  |
                |                      |   or (10) at variance with other |
                |                      |   three.                         |
                |                       ----------------------------------
                |
O.*******************************************
  *Check that the TFR and aircraft weight  *
  *readings decrease by the sum of the four*
  *FC indicator readings.  IF -            *
  ******************************************
                |    |
                |    |                  ----------------------------------
                |    |                 |TFR and aircraft weight readings  |
               OK   NOT OK-------|do not decrease by the sum of the |
                |                      |four FC indicators - Chart 110.   |
                |                       ----------------------------------
                |
P.*******************************************
  *Check that the FFR indicators return to *
  *zero and the FE flags are showing. IF - *
  ******************************************
                |    |
                |    |                  ----------------------------------
                |    |                 |An FFR indicator does not return  |
               OK   NOT OK-------|to zero and/or the FE flag does   |
                |                      |not appear in the mode flag window|
                |                      |- renew FFR Indicator (11),(12),  |
                |                      |(13) or (14).                     |
                |                       ----------------------------------
                |
```

```
                |
Q.*******************************************
  *Check that, when the SERVO switch is on,*
  *all main and reheat warning lights on    *
  *the FC indicators are lit and that when *
  *the switch is released, they go out      *
  *within 10 s.  IF -                       *
  ******************************************
                |    |
                |    |            ---------------------------------
                |    |           |1. Main and/or reheat warning     |
               OK   NOT OK-------|   lights do not come on when     |
                |                |   SERVO switch is operated and   |
                |                |   held on - Chart 111.           |
                |                |2. Main and reheat warning lights |
                |                |   do not go out within 10 s of   |
                |                |   SERVO switch being released -  |
                |                |   Chart 112.                     |
                |                 ---------------------------------
                |
R.*******************************************
  *Check that the aircraft weight and fuel *
  *load (TFR) can be set to zero in the     *
  *least significant digit and blank in     *
  *others.  IF -                            *
  ******************************************
                |    |
                |    |            ---------------------------------
                |    |           |Aircraft weight and fuel load on |
               OK   NOT OK-------|the TFR indicator cannot be set to|
                |                |zero - renew TFR Indicator (6).   |
                |                 ---------------------------------
                |
S.*******************************************
  *Check that the TFR indicator completes  *
  *the memory test at 0, 7 and 8 displays  *
  *in turn on each digit.  IF -            *
  ******************************************
                |    |
                |    |            ---------------------------------
                |    |           |TFR indicator fails to complete  |
               OK   NOT OK-------|memory test - renew TFR Indicator |
                |                |(6).                              |
                |                 ---------------------------------
```

```
                 |
T.*****************************************
  *Check that all four FC indicators can be*
  *set to zero in the least significant    *
  *digit and blank in the others.  IF-     *
  ******************************************
                 |    |
                 |    |               ----------------------------------
                 |    |              |FC indicator does not set to zero |
                OK   NOT OK-------|in the least significant digit and|
                 |                   |blank in others - renew faulty FC |
                 |                   |Indicator (7),(8),(9) or (10).    |
                 |                    ----------------------------------
                 |
U.*****************************************
  *Check that the four FC indicators can be*
  *set to 1777, 1888 and 2000 on COUNT test*
  *and that the MEMORY test at each reading*
  *is satisfactory.  IF -                  *
  ******************************************
                 |    |
                 |    |               ----------------------------------
                 |    |              |FC indicator displays do not set  |
                OK   NOT OK-------|to 1777, 1888 or 2000 and/or      |
                 |                   |memory checks are not satisfactory|
                 |                   |- Chart 113.                      |
                 |                    ----------------------------------
                 |
V.*****************************************
  *Check that, when the dimmer control is  *
  *operated, the digit displays brighten   *
  *and dim in response to the control      *
  *position.  IF -                         *
  ******************************************
                 |    |
                 |    |               ----------------------------------
                 |    |              |Digit displays do not dim and     |
                OK   NOT OK-------|brighten as the dimmer control is |
                 |                   |operated - Chart 114.             |
                 |                    ----------------------------------
                 |
W.*****************************************
  *Check that the index knob on each FFR   *
  *indicator rotates smoothly and that the *
  *index counters repeat the readings. IF -*
  ******************************************
                 |    |
```

```
                |     |
                |     |          ----------------------------------
                |     |         |Index knob on an FFR indicator    |
               OK    NOT OK-------|does not rotate smoothly and/or  |
                |               |index counter does not repeat     |
                |               |reading of index - renew FFR Indi-|
                |               |cator (11),(12),(13) or (14).     |
                |                ----------------------------------
                |
X.******************************************
  *Check that the switch output to the     *
  *configuration warning system (Ref.      *
  *77-13-00) changes state when the FFR    *
  *index reaches approximately full scale. *
  *IF -                                    *
  ******************************************
                |     |
                |     |          ----------------------------------
                |     |         |Switch output to the configuration|
               OK    NOT OK-------|warning system does not change    |
                |               |state at approximately full scale |
                |               |index - trouble shoot in accord-  |
                |               |ance with 71-00-37.               |
                |                ----------------------------------
                |
Y.******************************************
  *Switch off and disconnect electrical    *
  *ground power as detailed in 24-41-00;   *
  *check that the FFR indicator pointers   *
  *read zero and the failure warning flags *
  *are in view.  IF -                      *
  ******************************************
                      |
                      |          ----------------------------------
                      |         |Renew faulty FFR Indicator (11),  |
                     NOT OK-------|(12),(13) or (14).                |
                                 ----------------------------------
```

```
*******************************
*CENTRE BARS NOT DISPLAYED, OR*
*READING OTHER THAN CENTRE    *
*BARS DISPLAYED, ON THE TFR   *
*AND FC INDICATORS WHEN POWER *
*IS FIRST SWITCHED ON.        *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
 -----------------        -----------------        -----------------
|Are centre bars  |      |Perform a display|      |Renew TFR Indi-  |
|displayed on some|-YES-|restoration test |-YES-|cator (6) or FC  |
|indicators?      |      |on each indicator|      |Indicator (7),   |
 -----------------       |not showing      |      |(8),(9) or (10). |
         |               |centre bar, to   |       -----------------
         NO              |prove the Pinlite|
         |               |filaments. Is    |
 -----------             |centre bar now   |
|Is a read- |            |lit?             |
|ing other  |             -----------------
|than centre|                      |
|bars dis-  |     -----------      |
|played as  |-YES-|Renew Elec-|    NO
|soon as    |     |tronic Unit|    |
|power is   |     |(23).      |  -----------------
|applied?   |      -----------  |Renew faulty     |
 -----------                    |Pinlite          |
                                |filaments.       |
                                 -----------------
```

Chart 101

****
*MAIN AND/OR REHEAT WARNING *
*LIGHTS COME ON AND DO NOT GO *
OUT WITHIN 10 s WHEN POWER IS
*FIRST SWITCHED ON. *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

Have main and/or reheat warning lights on some indicators gone out within 10 s?

-YES- Perform a servo test and check that the warning lights go out within 10 s of the servo switch being released.

-YES- Check the integrity of the density correction system after engine start (Ref. 73-33-00, Adjustment/Test).

NO (from "Have main and/or reheat warning lights on some indicators gone out within 10 s?"): If main and reheat warning lights on all FC indicators fail to come on, check warning lamp test switch (Ref. 33-14-00).

NO (from "Perform a servo test…"): Renew FC Indicator (7),(8),(9) or (10).

NO (from "Check the integrity of the density correction system…"): Renew Transmitter (15),(16),(17), (18),(19),(20), (21) or (22) in appropriate channel(s).

Chart 102

```
*******************************
*POWER FAILURE WARNING FLAG   *
*REMAINS IN VIEW ON FFR       *
*INDICATOR WITH POWER ON.     *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
 -------------------       ------------------
|Check for 115 V a.c.|-YES-|Renew FFR Indicator|
|output from CB (2), |     |(11),(12),(13) or  |
|(3),(4) or (5).     |     |(14).              |
 -------------------       ------------------
         |
         NO
         |
 -------------------
|Renew CB (2),(3),(4)|
|or (5).             |
 -------------------
```

Chart 103

```
*******************************
*FFR INDICATORS DO NOT READ   *
*ZERO WHEN POWER IS SWITCHED  *
*ON.                          *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
 ----------------            ----------------
|Are some FFR    |          |Renew FFR Indi- |
|indicators      |-YES-     |cator (11),(12),|
|reading zero?   |          |(13) or (14) not|
 ----------------           |reading zero.   |
        |                    ----------------
        NO
        |
 ----------------
|Check signal from|
|associated FC    |
|indicator.       |
 ----------------
```

Chart 104

Printed in England

```
********************************
*WITH RIGHT RESET KNOB AT "N",*
*WHEN LEFT RESET KNOB IS      *
*PRESSED AND HELD, DIGITS ON  *
*TFR INDICATOR DO NOT DISPLAY *
*FIGURE EIGHT.                *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
 -----------------          ------------------
|Do some digits   |        |Renew Pinlite      |
|display a figure |-YES-   |filaments which    |
|eight and some   |        |fail to display    |
|an incomplete    |        |complete figure    |
|figure eight?    |        |eight.             |
 -----------------          ------------------
         |
         NO
         |
 -----------------
|Renew TFR        |
|Indicator (6).   |
 -----------------
```

Chart 105

```
********************************
*TFR AND FC INDICATORS SHOW    *
*CENTRE BARS WHEN LEFT RESET   *
*KNOB ON TFR INDICATOR IS      *
*RELEASED.                     *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
 --------------------        --------------------
|Are some indicators |      |Renew TFR Indicator |
|displaying a reading|-YES-|(6) or FC Indicator |
|other than centre   |      |(7),(8),(9) or (10) |
|bars?               |      |which displays      |
 --------------------       |centre bars.        |
          |                  --------------------
          NO
          |
 --------------------
|Renew Electronic    |
|Unit (23).          |
 --------------------
```

Chart 106

```
*******************************
*MAIN AND/OR REHEAT WARNING   *
*LIGHTS DO NOT COME ON WHEN   *
*ASSOCIATED RESET KNOB ON FC  *
*INDICATOR IS RELEASED AFTER  *
*BEING TURNED CLOCKWISE.      *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
 ----------------           ----------------           ----------------
|Operate warning |         |Perform a servo |         |Check the integ-|
|lights test     |-YES-    |test and check  |-YES-    |rity of the     |
|switch (Ref.    |         |that the warning|         |density         |
|33-14-00) and   |         |lights come on  |         |correction system|
|check that lights|        |and then go out |         |after engine    |
|come on.        |         |within 10 s of  |         |start (Ref.     |
 ----------------          |the switch being|         |73-33-00,       |
        |                  |released.       |         |Adjustment/Test).|
        NO                  ----------------           ----------------
        |                                                     |
 ----------------                                             NO
|Renew FC        |                                            |
|Indicator (7),  |                                     ----------------
|(8),(9) or (10).|                                    |Renew Transmitter|
 ----------------                                     |(15),(16),(17), |
                                                      |(18),(19),(20), |
                                                      |(21) or (22) in |
                                                      |appropriate     |
                                                      |channel(s).     |
                                                       ----------------
```

Chart 107

```
*******************************
*FFR INDICATORS DO NOT READ   *
*BETWEEN 27 AND 33 WHEN COUNT *
*SWITCH IS OPERATED.          *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
 --------------------          --------------------
|Do all four FFR     |        |Renew Electronic    |
|indicators fail to  |-YES-   |Unit (23).          |
|read between 27 and |         --------------------
|33?                 |
 --------------------
          |
          NO
          |
 --------------------          --------------------
|Do some FFR indicat-|        |Renew FFR Indicator |
|ors read between 27 |-YES-   |(11),(12),(13) or   |
|and 33?             |        |(14), not reading   |
 --------------------         |between 27 and 33.  |
                               --------------------
```

Chart 108

```
********************************
*FC INDICATORS DO NOT READ     *
*CORRECTLY WHEN COUNT SWITCH   *
*IS RELEASED AFTER 36 s.       *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
 --------------------          --------------------
|Do all four FC      |        |Renew Electronic    |
|indicators fail to  |-YES-|Unit (23).           |
|read the same count |         --------------------
|as FFR indicators?  |
 --------------------
          |
          NO
          |
 --------------------          --------------------
|Do any FC indicat-  |        |Renew FC Indicator  |
|ors fail to read the|-YES-|(7),(8),(9) or (10).|
|same count as FFR   |         --------------------
|indicators?         |
 --------------------
```

Chart 109

TFR AND AIRCRAFT WEIGHT READINGS DO NOT DECREASE BY THE SUM OF THE FOUR FC INDICATOR READINGS WHEN COUNT SWITCH IS RELEASED AFTER 36 s.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

Disconnect three FC indicators and note reading on fourth. Note also TFR indicator readings. Hold COUNT switch on for 15 s and check that FC increase equals TFR decrease.

- NO: Repeat for remaining FC indicators as necessary.
- YES: Connect active FC indicator to other three positions in turn. Note readings and again operate COUNT switch for 15 s. Does FC increase equal TFR decrease in each instance?
  - NO: Renew TFR Indicator (6).
  - YES: Disconnect FC indicator and connect other three in turn. Note readings and operate COUNT switch for 15 s in each instance. Does FC increase equal TFR decrease in each instance?
    - NO: Renew FC Indicator (6),(7),(8),(9) or (10) where FC increase differs from TFR decrease.

Chart 110

```
*******************************     ---------------------------------
*MAIN AND/OR REHEAT WARNING   *    |GROUND EQUIPMENT REQUIRED        |
*LIGHTS DO NOT COME ON WHEN   *    |---------------------------------|
*SERVO SWITCH IS OPERATED AND *    |DESCRIPTION             PART NO. |
*HELD ON.                     *    |---------------------------------|
*******************************    |GROUND POWER SUPPLY     -        |
                                   |MULTIMETER              -        |
                                    ---------------------------------

 -----------------        -----------------        -----------------
|Do all main and  |      |Operate warning  |      |Renew Electronic |
|reheat warning   |-YES-|lights test      |-YES-|Unit (23).       |
|lights fail to   |      |switch (Ref.     |        -----------------
|come on when     |      |33-14-00) and    |
|SERVO switch is  |      |check if lights  |
|operated?        |      |now come on.     |
 -----------------        -----------------
         |
         NO
         |
 -----------------        -----------------        -----------------
|Do some warning  |      |Operate warning  |      |Renew associated |
|lights come on   |-YES-|lights test      |-YES-|Transmitter (17),|
|when SERVO switch|      |switch (Ref.     |      |(18),(19),(20),  |
|is operated?     |      |33-14-00). Do all|      |(21) or (22).    |
 -----------------       |warning lights   |        -----------------
                         |now come on?     |
                          -----------------
                                 |
                                 NO
                                 |
                          ------------------
                         |Renew FC Indicator|
                         |(7),(8),(9) or    |
                         |(10).             |
                          ------------------
```

Chart 111

MAIN AND/OR REHEAT WARNING LIGHTS DO NOT GO OUT WITHIN 10 s OF SERVO SWITCH BEING RELEASED.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

Do main and/or reheat warning lights go out immediately SERVO switch is released?

-YES- Renew associated FC Indicator (17),(18),(19),(20),(21) or (22).

NO

Do main and/or reheat warning lights fail to go out within 10 s of SERVO switch being released?

-YES- Renew associated FC Indicator (17),(18),(19),(20),(21) or (22).

Chart 112

```
*******************************
*FC INDICATOR DISPLAYS DO NOT *
*SET TO 1777, 1888 OR 2000    *
*AND/OR MEMORY CHECKS ARE NOT *
*SATISFACTORY.                *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
 --------------------          -----------------
|Do all four FC      |        |Renew Electronic |
|indicators remain at|-YES-   |Unit (23).       |
|zero when COUNT     |         -----------------
|switch is operated? |
 ====================
         |
         NO
         |
 --------------------          -------------------
|Do some FC indicators|       |Renew FC Indicator |
|remain at zero when  |-YES-  |(7),(8),(9) or (10)|
|COUNT switch is      |       |which remains set to|
|operated?            |       |zero.              |
 --------------------          -------------------
         |
         NO
         |
 --------------------          -------------------
|Do some FC indicators|       |Renew FC Indicator |
|operate on COUNT but |-YES-  |(7),(8),(9) or (10),|
|fail the memory test?|       |failing the memory |
 --------------------         |test. If all four FC|
                              |indicators fail,   |
                              |renew Electronic   |
                              |Unit (23).         |
                               -------------------
```

Chart 113

```
*******************************
*DIGIT DISPLAYS DO NOT DIM AND*
*BRIGHTEN AS THE DIMMER       *
*CONTROL IS OPERATED.         *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
 --------------------       --------------------
|Do some digit       |     |Renew FC Indicator  |
|displays fail to dim|-YES-|(7),(8),(9) or (10),|
|and brighten as the |     |or TFR Indicator    |
|dimmer control is   |     |(6) as applicable.  |
|operated?           |      --------------------
 --------------------
          |
          NO
          |
 --------------------       ---------------------
|Check dimmer control|     |Renew Electronic     |
|unit for            |-YES-|Unit (23).           |
|serviceability.     |      ---------------------
 --------------------
          |
          NO
          |
 --------------------
|Renew Dimmer Control|
|Unit (24).          |
 --------------------
```

Chart 114

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(1) Circuit breaker 115 V	-	13-216	E473	Map ref.D5	24-50-00 R/I	73-33-01
(2) Circuit breaker 115 V	-	14-215	E471	Map ref.C15	24-50-00 R/I	73-33-01
(3) Circuit breaker 115 V	-	13-215	E472	Map ref.D16	24-50-00 R/I	73-33-01
(4) Circuit breaker 115 V	-	13-216	E564	Map ref.D4	24-50-00 R/I	73-33-02
(5) Circuit breaker 115 V	-	14-216	E565	Map ref.B3	24-50-00 R/I	73-33-02
(6) Total fuel remaining indicator	-	5-214	E474	3CM station	73-33-13 R/I	73-33-01
(7) No.1 engine fuel consumed indicator	-	5-214	1E475	3CM station	73-33-12 R/I	73-33-01
(8) No.2 engine fuel consumed indicator	-	5-214	2E475	3CM station	73-33-12 R/I	73-33-01
(9) No.3 engine fuel consumed indicator	-	5-214	3E475	3CM station	73-33-12 R/I	73-33-02
(10) No.4 engine fuel consumed indicator	-	5-214	4E475	3CM station	73-33-12 R/I	73-33-02
(11) No.1 engine fuel flow rate indicator	-	6-211	1E476	Centre instr. panel	73-33-11 R/I	73-33-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(12) No.2 engine fuel flow rate indicator	-	6-211	2E476	Centre instr. panel	73-33-11 R/I	73-33-01
(13) No.3 engine fuel flow rate indicator	-	6-211	3E476	Centre instr. panel	73-33-11 R/I	73-33-02
(14) No.4 engine fuel flow rate indicator	-	6-211	4E476	Centre instr. panel	73-33-11 R/I	73-33-02
(15) No.1 engine main flowmeter transmitter	-	415	1E477	No.1 engine	73-33-01 R/I	73-33-01
(16) No.1 engine reheat flowmeter transmitter	-	415	1E478	No.1 engine	73-33-02 R/I	73-33-01
(17) No.2 engine main flowmeter transmitter	-	426	2E477	No.2 engine	73-33-01 R/I	73-33-01
(18) No.2 engine reheat flowmeter transmitter	-	426	2E478	No.2 engine	73-33-02 R/I	73-33-01
(19) No.3 engine main flowmeter transmitter	-	435	3E477	No.3 engine	73-33-01 R/I	73-33-02
(20) No.3 engine reheat flowmeter transmitter	-	435	3E478	No.3 engine	73-33-02 R/I	73-33-02

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF.	
					MAINT. TOPIC	WIRING DIAGRAM
(21) No.4 engine main flowmeter transmitter	-	446	4E477	No.4 engine	73-33-01 R/I	73-33-02
(22) No.4 engine reheat flowmeter transmitter	-	446	4E478	No.4 engine	73-33-02 R/I	73-33-02
(23) Electronic unit	-	1-216	E480	Flight compartment RH racking	73-33-16 R/I	73-33-01
(24) Dimmer control unit	-	11-214	E481	3CM station	73-33-00 R/I	73-33-01

Component Identification
Table 101

END OF THIS SECTION

NEXT

EXHAUST GAS TEMPERATURE INDICATION - TROUBLE SHOOTING

1. General

R A. An apparently abnormal exhaust gas temperature (EGT) may be
R the result of an engine defect, an engine control system
R malfunction or an EGT indication system defect. Experience
R has also shown that contamination of the engine fuel system
R by hydraulic fluid may also cause an abnormal EGT during
R engine start.

R Basic engine defects tend to give a high exhaust gas
R temperature. Only in remote instances will low temperature
R indication be due to the basic engine.

R When trouble shooting, it is necessary to confirm initially
R that the abnormal EGT is not due to an indication system
R fault by carrying out a functional test of the EGT indica-
R tion system. A satisfactory result indicates an engine or
R an engine control system defect.

B. Exhaust Gas Temperature (EGT) Indication.

(1) The jet pipe thermocouple harness contains three separate circuits of eight thermocouples in parallel. One circuit supplies an input to the control system main amplifier, the second circuit supplies an input to the control system alternate amplifier, and the third circuit supplies the input to the EGT indicator.

(2) The resistance of the jet pipe thermocouple harness, measured at an ambient temperature of between 15 and 20 deg C, is inscribed on the harness junction box.

Resistance of individual circuits in the thermocouple harness is very small and will vary with ambient temperature. Measuring the resistance of a harness on a hot engine is therefore meaningless.

(3) The jet pipe thermocouple harness may be regarded as serviceable with a permitted number of unserviceable thermocouples in any circuit (Ref.77-21-02).

(4) Thermocouple circuitry is comprised of chromel and alumel wiring. Trouble shooting does not take into account the thermocouple effect of single or double 'crossovers' of wiring in the circuit.

R (5) The yellow light on the EGT indicator bezel will illuminate whenever the selected engine control amplifier safety circuit detects an EGT signal failure (open circuit). Manual selection to the alternative engine control amplifier will extinguish the light providing the EGT signal to that amplifier is satisfactory.

In the event of the yellow light illuminating on 'Main' and 'Altern' control systems together with loss of EGT indication, it is indicative of a breakage in the jet pipe thermocouple harness or lead causing an open circuit in all three supplies.

C. Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is detailed in Table 101.

2. Preparation

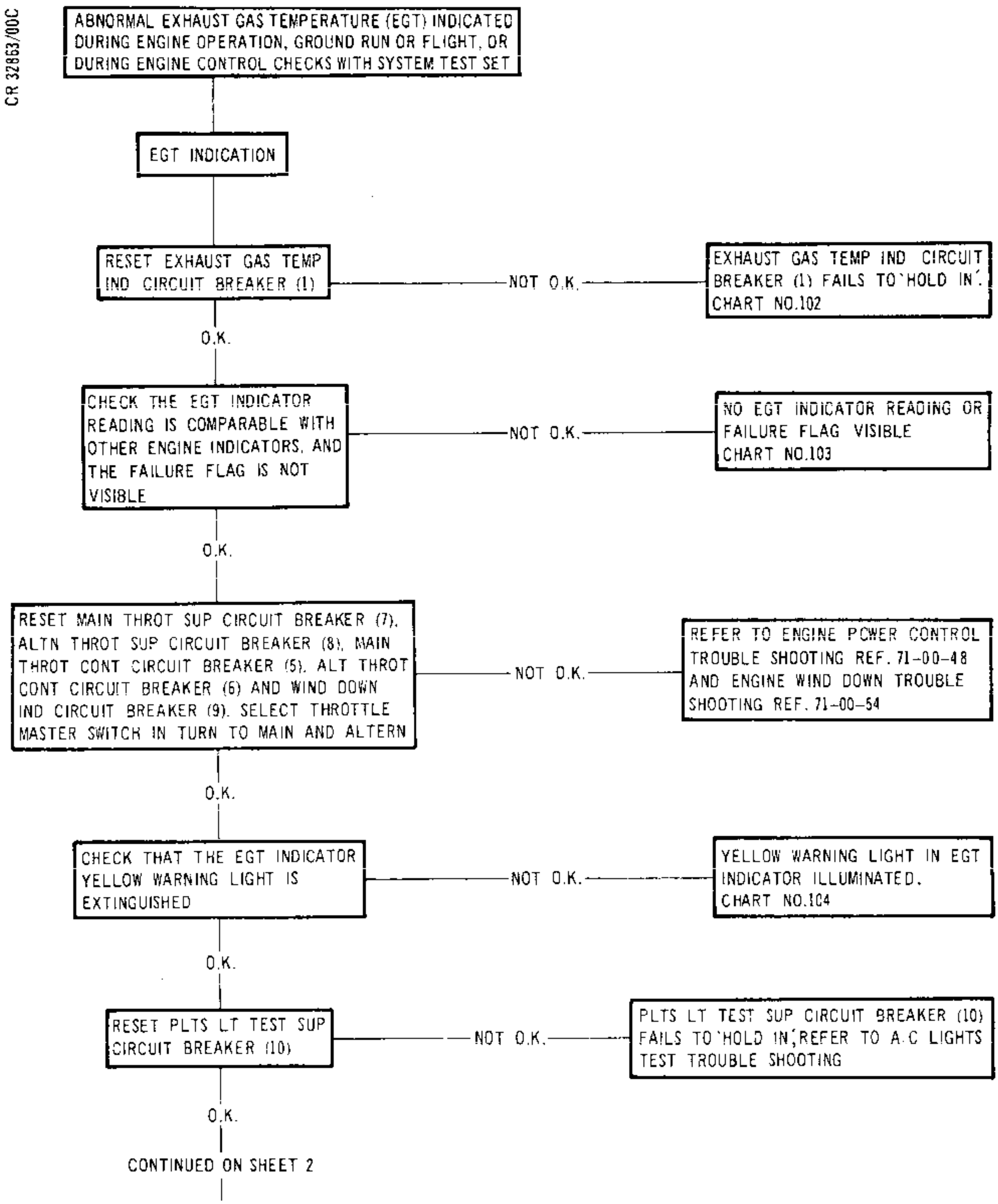
A. Ensure that external electrical power supply is connected and switched on.

B. Consult Chart 101 and carry out the actions indicated to determine which of the trouble shooting charts is applicable.

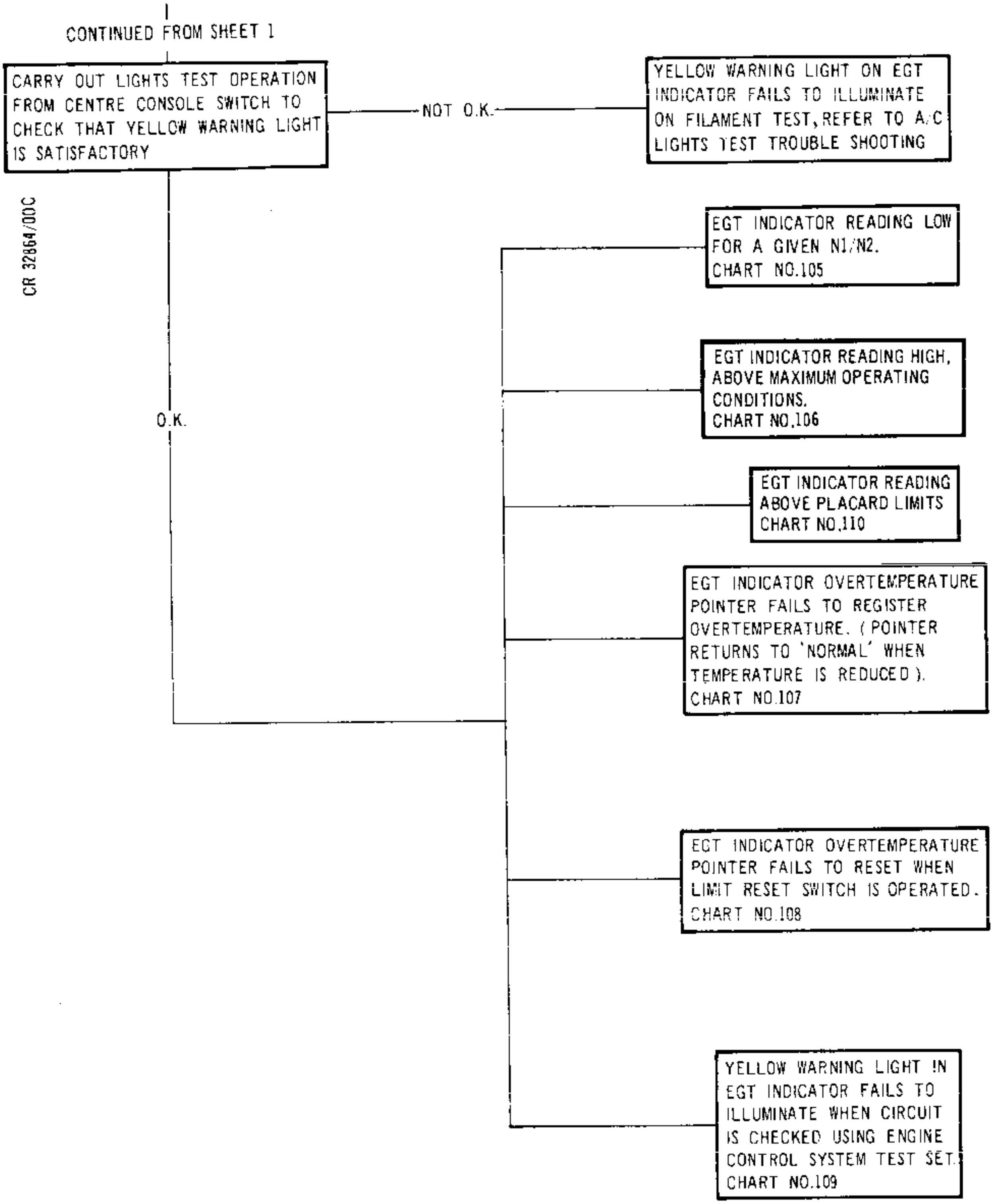
3. Restore to Flight Standard

A. Complete and check any necessary rectification.

B. Reconnect all points where disconnection has been made during checking and rectification procedures.



R Chart 101 (Sheet 1 of 2)



R

Chart 101 (Sheet 2 of 2)

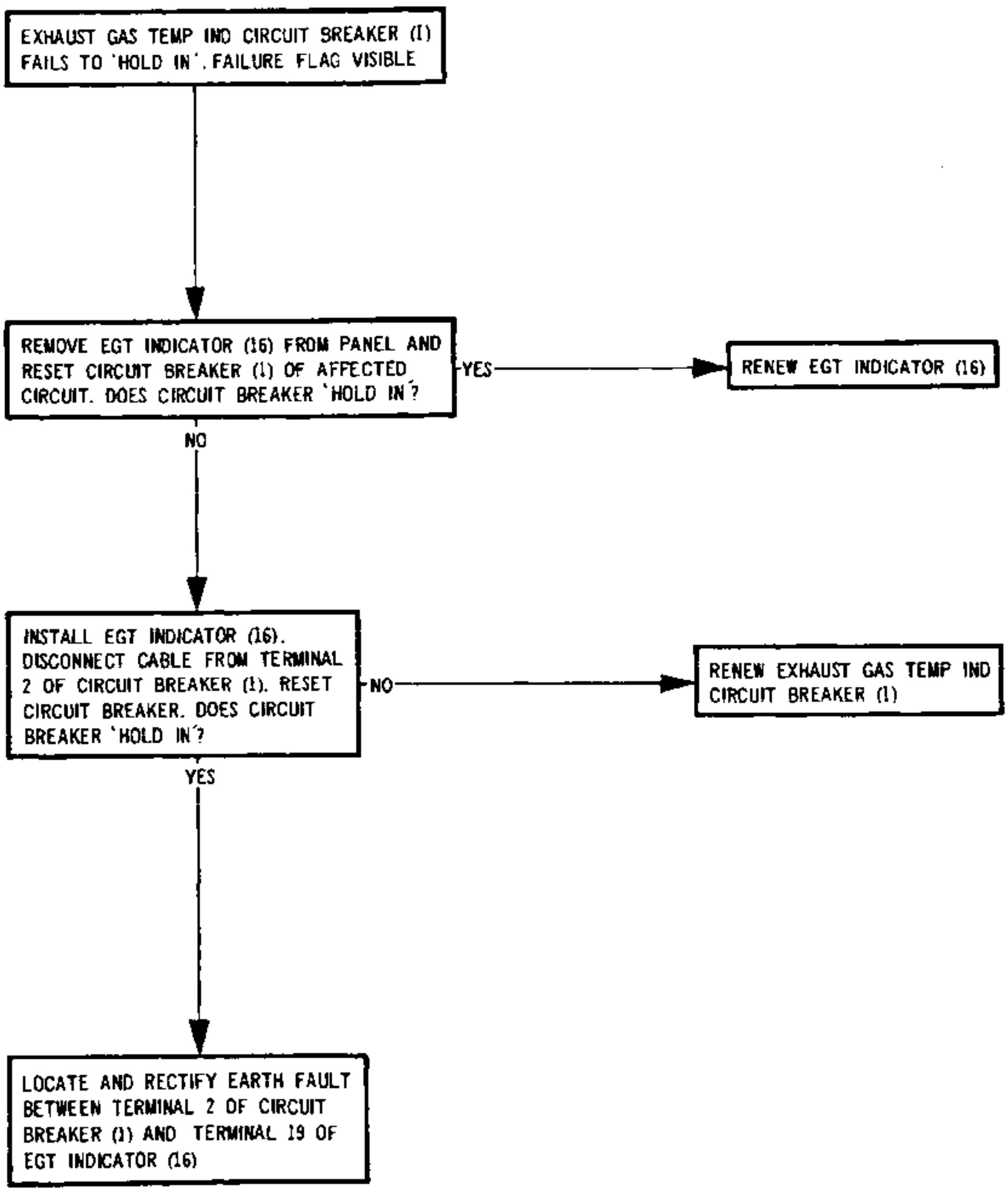
GROUND EQUIPMENT

DESCRIPTION

GROUND POWER SUPPLY(115 V A.C.)

MULTI-TEST METER

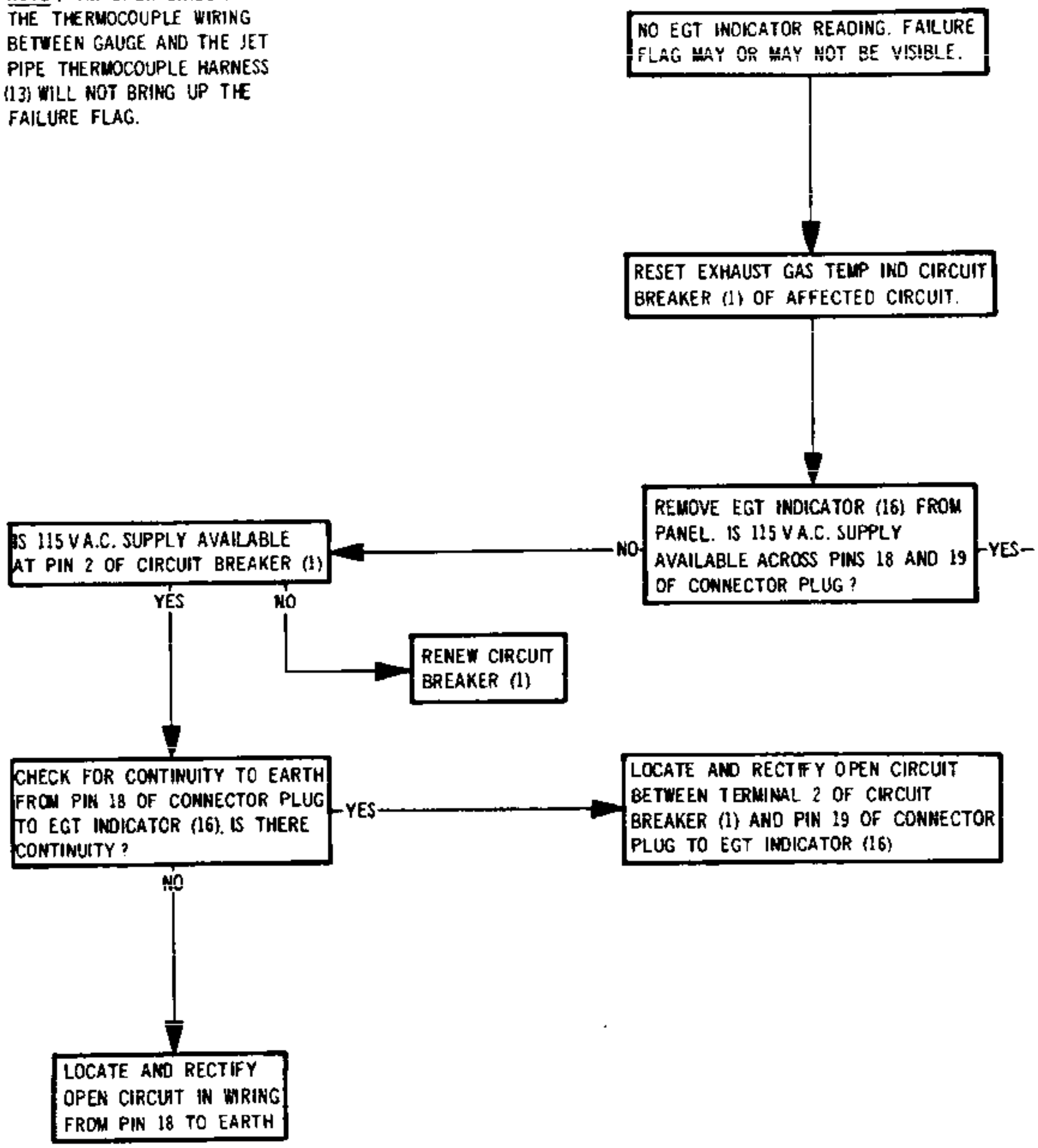
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 34 1 BAMO

Chart 102

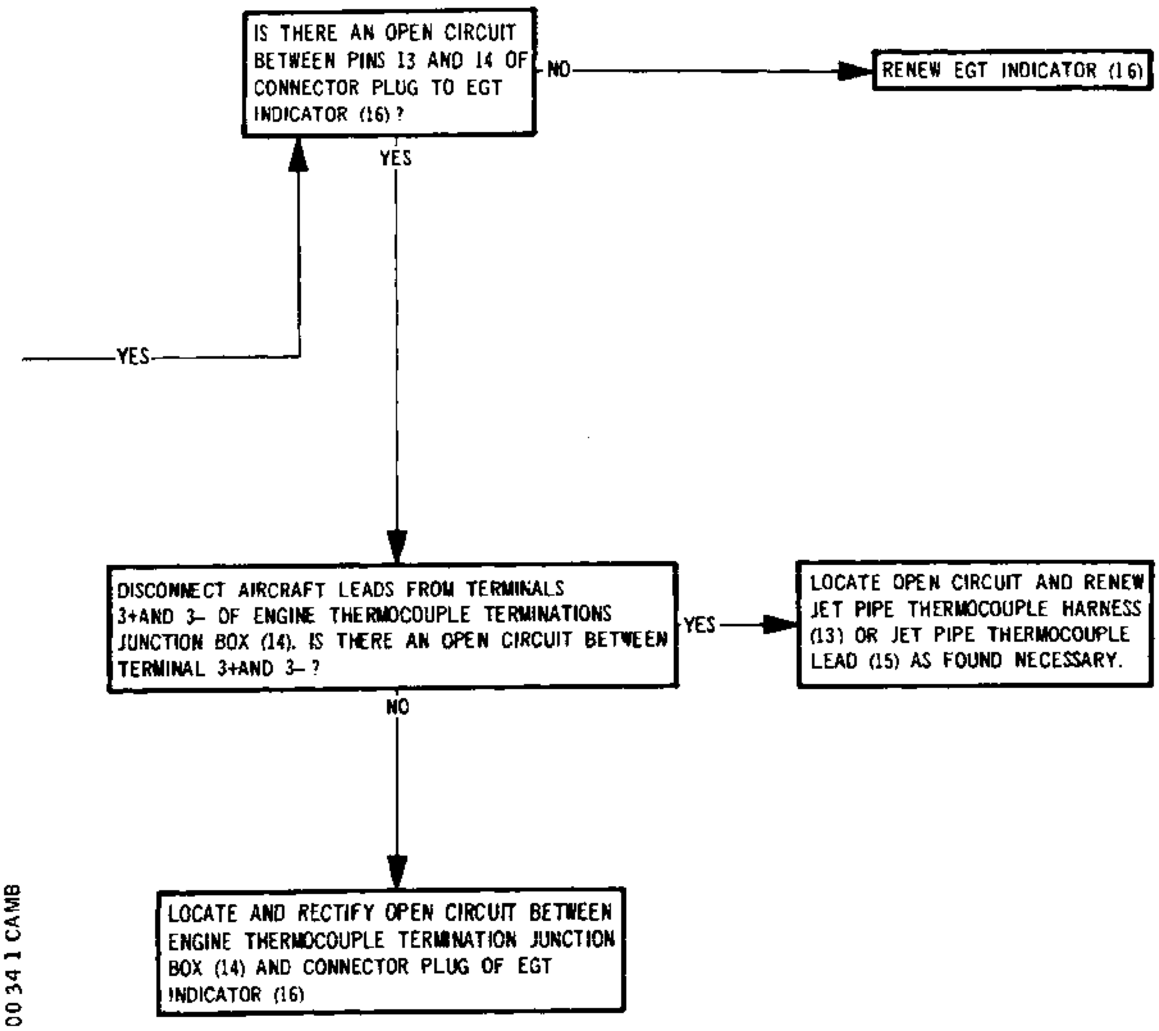
NOTE : AN OPEN CIRCUIT IN THE THERMOCOUPLE WIRING BETWEEN GAUGE AND THE JET PIPE THERMOCOUPLE HARNESS (13) WILL NOT BRING UP THE FAILURE FLAG.



CMR 71 00 34 1 CAMA

Chart 103 (Sheet 1 of 2)

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (115 V.A.C.)
MULTI-TEST METER

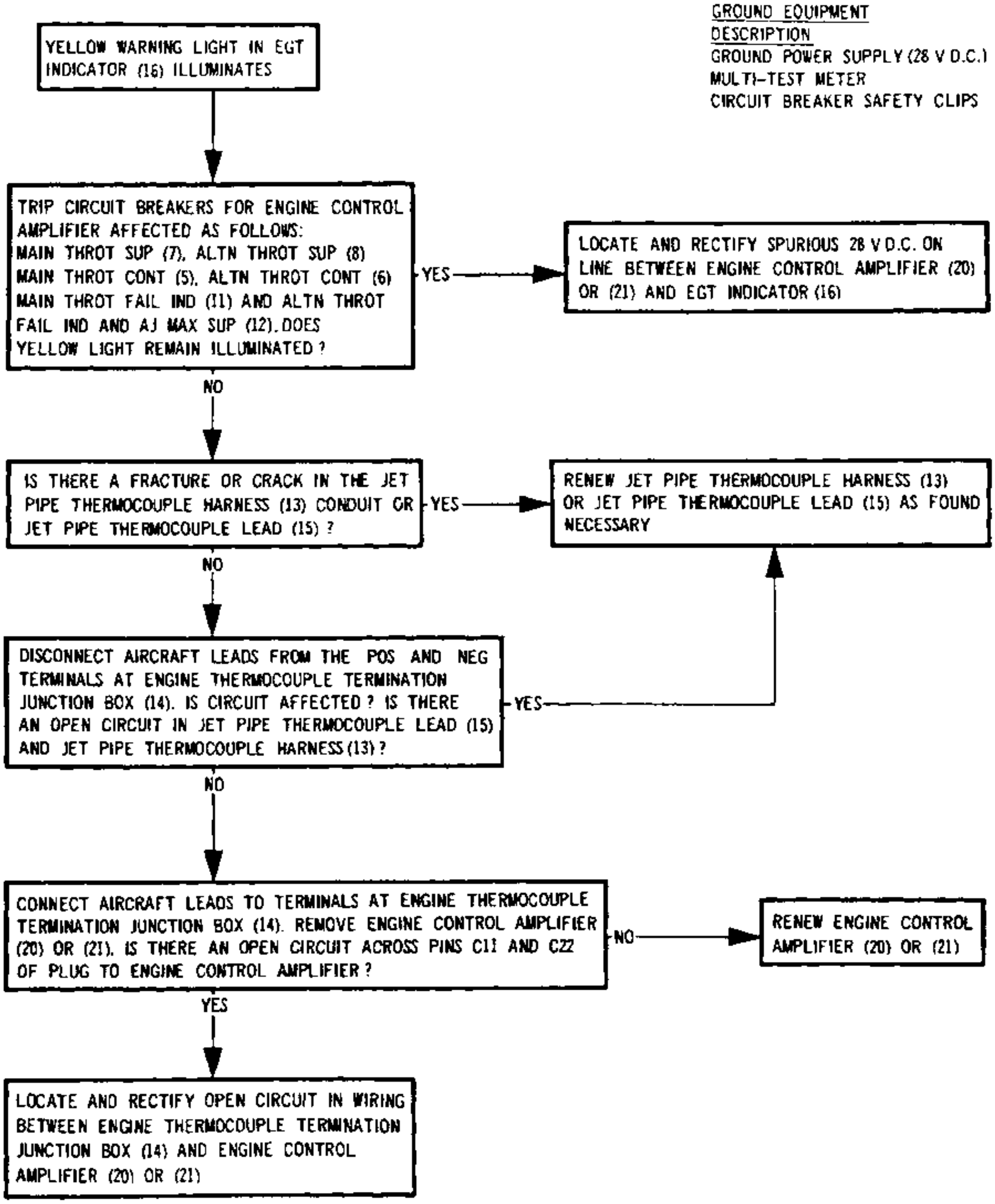


CMR 71 00 34 1 CAMB

Chart 103 (Sheet 2 of 2)

Printed in England

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (28 V D.C.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 34 1 DAMO

Chart 104

CR 32857/00B

NOTE : IF THE TEMPERATURE WITHIN THE JET PIPE IS SUCH THAT THE RESPONSE CHECK IS NOT POSSIBLE, THEN CONTINUE WITH THE HOWELL RECORDER CALIBRATION TEST PROCEDURE AND OTHER SEQUENCE CHECKS AS CONSIDERED NECESSARY

EGT INDICATOR READING LOW FOR A GIVEN N1/N2 (OUTSIDE THE NORMAL RANGE OF SCATTER)

RESET EXHAUST GAS TEMP IND CIRCUIT BREAKER (1) OF AFFECTED CIRCUIT

REMOVE EGT INDICATOR (16). CHECK LEADS FOR INSULATION AND FOR TOTAL RESISTANCE. REFER TO 77-21-00 FOR ACCEPTANCE LIMITS. IS CHECK SATISFACTORY ?

YES: RENEW EGT INDICATOR (16)

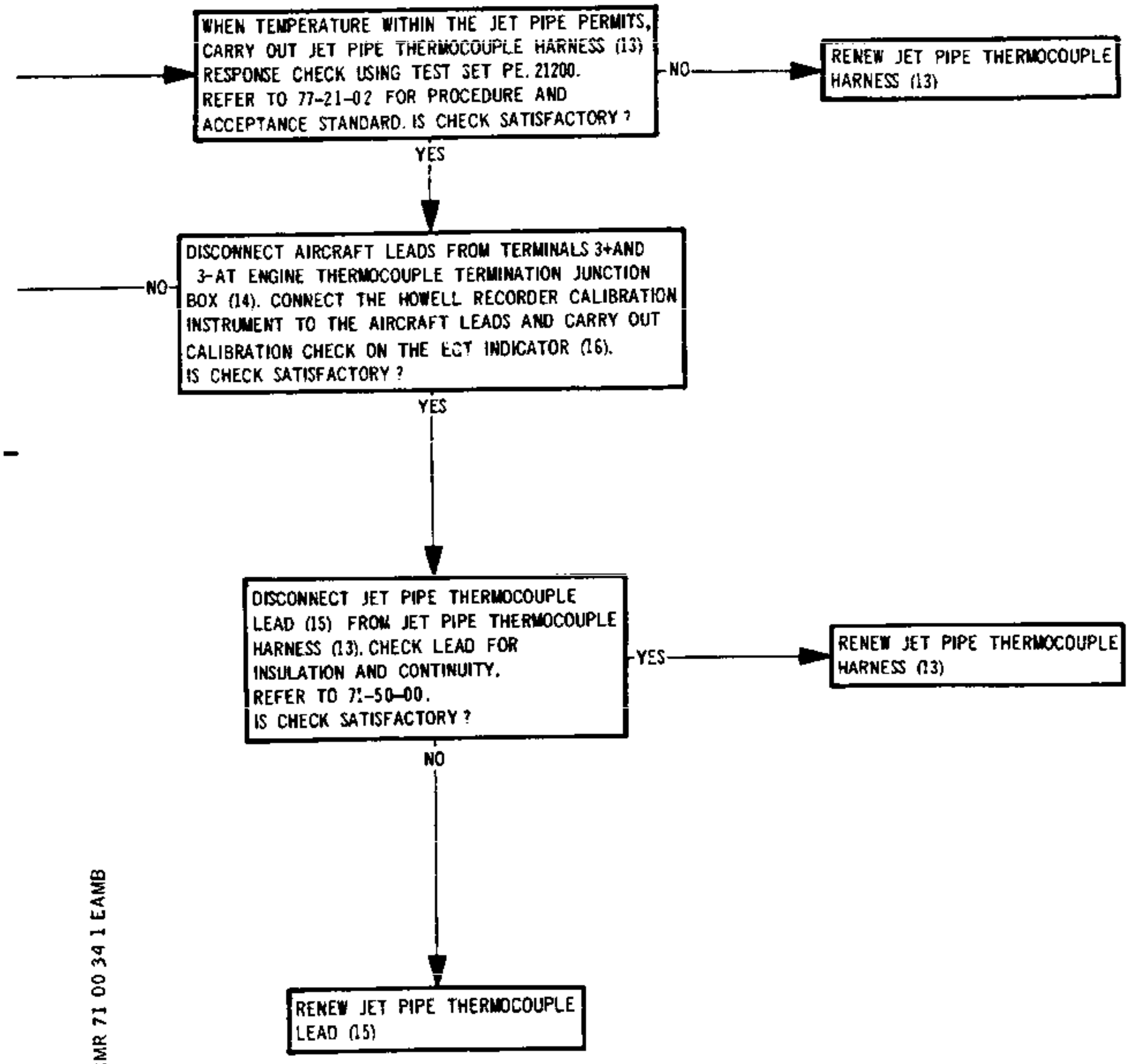
NO: LOCATE AND RECTIFY THE FAULT IN THE WIRING CIRCUIT BETWEEN TERMINALS 3+ AND 3- AT ENGINE THERMOCOUPLE TERMINATION JUNCTION BOX (14) AND PINS 13 AND 14 RESPECTIVELY OF PLUG TO EGT INDICATOR

IF ABOVE CHECKS ARE SATISFACTORY PROCEED AS FOLLOWS : A LOW INDICATED EGT CAN ARISE FROM H P COMPRESSOR DAMAGE. IF NO INSTRUMENTATION FAULT IS FOUND CHECK FOR COMPRESSOR DAMAGE AND RECTIFY AS NECESSARY.

R

Chart 105 (Sheet 1 of 2)

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (115 V.A.C.)
TEST SET PE. 21200
HOWELL RECORDER CALIBRATOR MODEL BH 153-3
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 34 1 EAMB

Chart 105 (Sheet 2 of 2)

NOTE: IF THE TEMPERATURE WITHIN THE JET PIPE IS SUCH THAT IT IS NOT POSSIBLE TO CARRY OUT THE RESPONSE CHECKS INITIALLY, THE SUBSEQUENT CHECKS MAY BE CARRIED OUT AS CONSIDERED NECESSARY

CR 32856/00B

GROUND EQUIPMENT

DESCRIPTION	
GROUND POWER SUPPLY (115 V.A.C.)	
TEST SET	PE. 21200
TEST SET	TE 111
BORESCOPE ASS.	PE. 24261
BORESCOPE ASS.	PE. 15889
LIGHT SOURCE BOX	PE. 15866
CIRCUIT BREAKER SAFETY CLIPS	

EGT INDICATOR READING HIGH FOR A GIVEN N1/N2 (OUTSIDE THE NORMAL RANGE OF SCATTER, ABOVE MAXIMUM OPERATING CONDITIONS)

RESET EXHAUST GAS TEMP IND CIRCUIT BREAKER (1)

WHEN TEMPERATURE WITHIN THE JET PIPE PERMITS, CARRY OUT JET PIPE THERMOCOUPLE HARNESS (13) RESPONSE CHECK USING TEST SET PE. 21200. REFER TO 77-21-02 FOR PROCEDURE AND ACCEPTANCE STANDARD. IS CHECK SATISFACTORY?

- NO → RENEW JET PIPE THERMOCOUPLE HARNESS (13)
- YES ↓

CONNECT TEST SET TE 111 TO THE TEST PLUG ON THE JET PIPE THERMOCOUPLE LEAD (15) AND CARRY OUT GAUGE CALIBRATION CHECK. REFER TO 77-21-00 FOR PROCEDURE AND ACCEPTANCE STANDARD. IS CHECK SATISFACTORY?

- NO → RENEW EGT INDICATOR (16)
- YES ↓

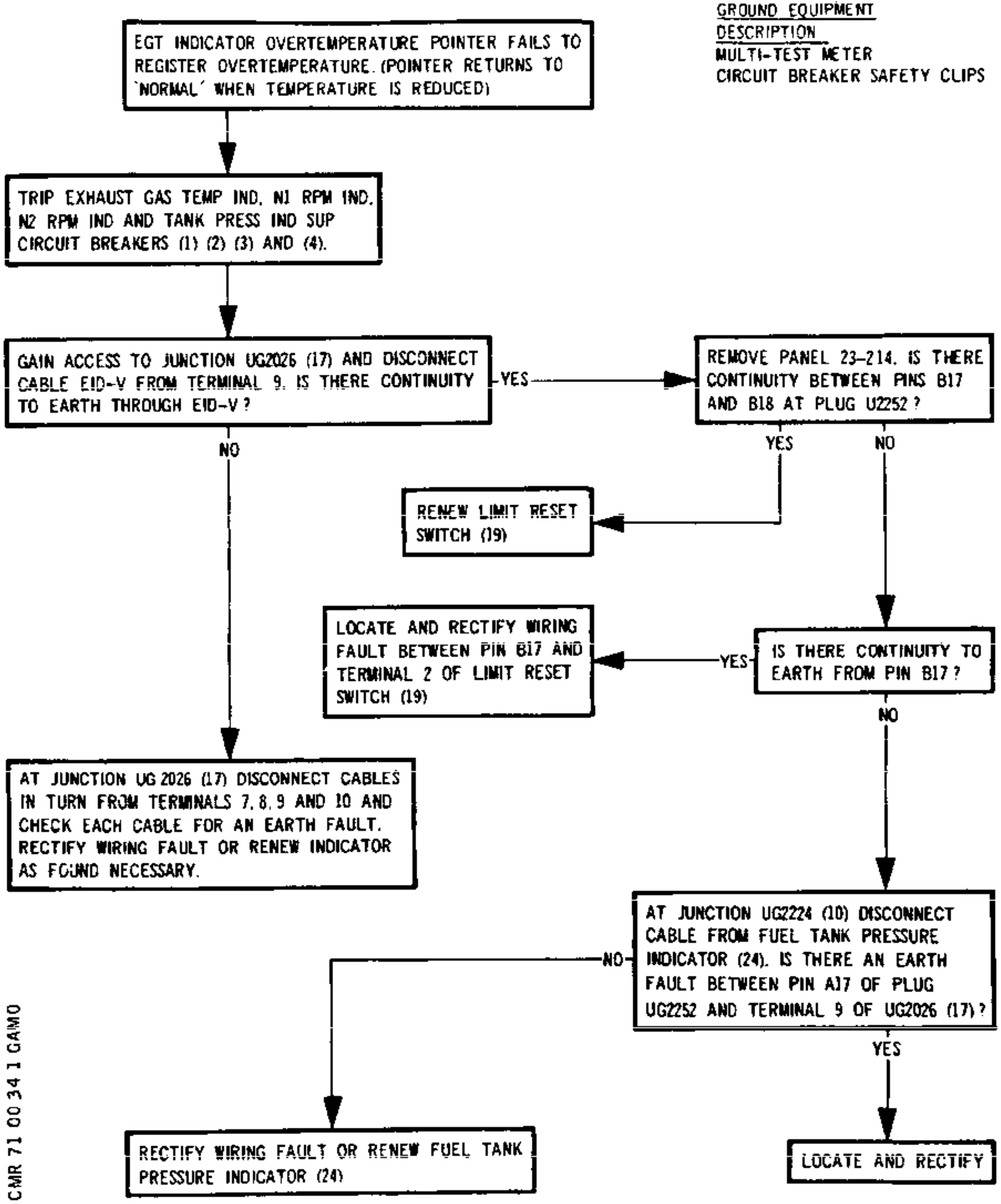
CHECK EGT LIMITER DATUMS IN ENGINE CONTROL AMPLIFIER, REFER TO 76-11-00 ENGINE POWER CONTROLS-ADJUSTMENT TEST. IS CHECK SATISFACTORY?

- NO → RENEW ENGINE CONTROL AMPLIFIER (20) OR (21)
- NO → CHECK FOR THE FOLLOWING DEFECTS AND RECTIFY AS NECESSARY:
  - (1) DAMAGE TO COMPRESSORS AND OR TURBINES
  - (2) SEVERE AIR LEAKAGE FROM COMPRESSOR BLEEDS
  - (3) DAMAGE TO FUEL VAPORISERS OR COMBUSTION CHAMBER
  - (4) DAMAGE TO AIR INTAKE
- YES → INTERMITTENT DEFECT, CONFIRM ORIGINAL REPORT

R

Chart 106

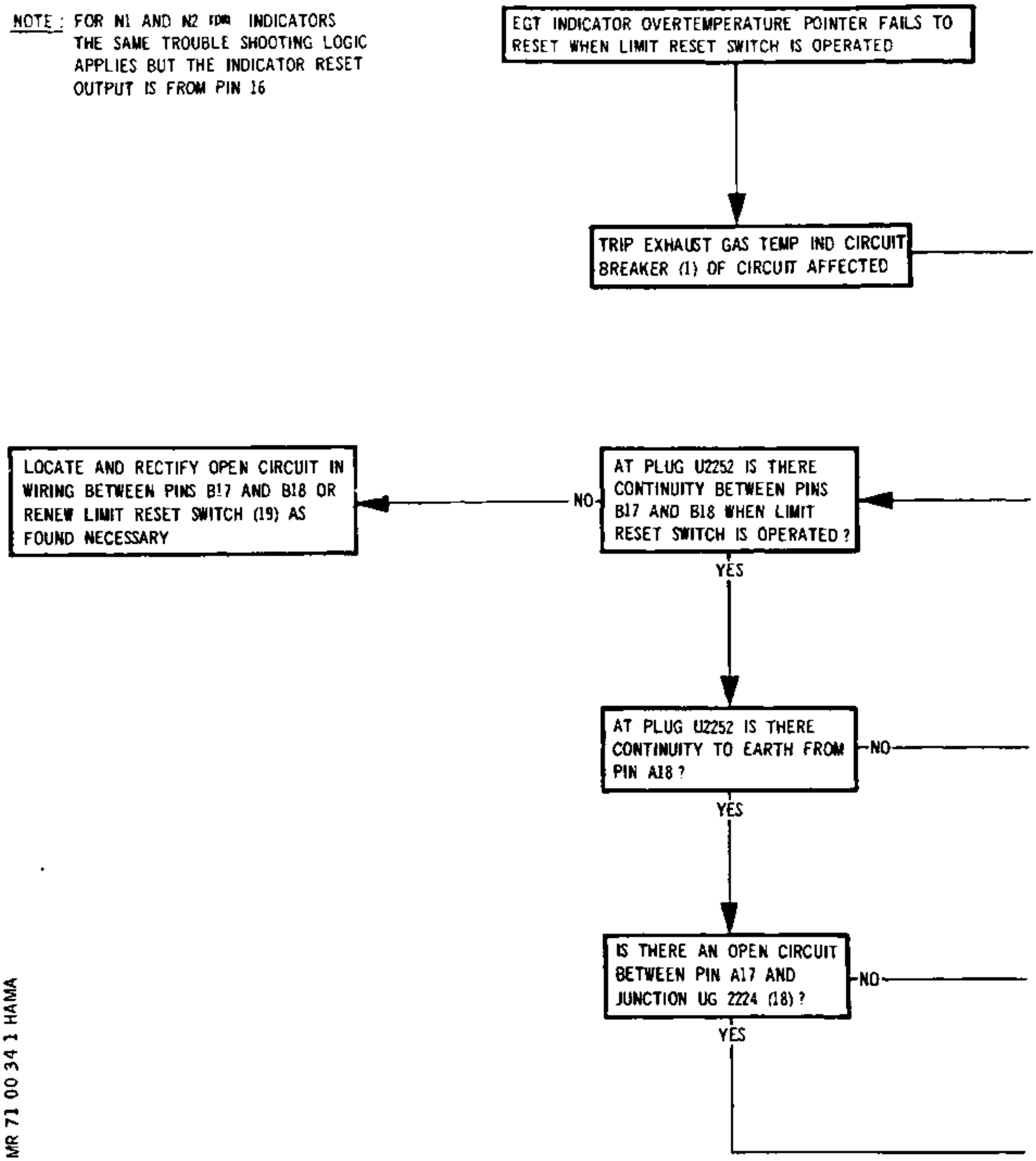
GROUND EQUIPMENT
DESCRIPTION
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 34 1 GAMO

Chart 107

NOTE: FOR N1 AND N2 FOR INDICATORS THE SAME TROUBLE SHOOTING LOGIC APPLIES BUT THE INDICATOR RESET OUTPUT IS FROM PIN 16

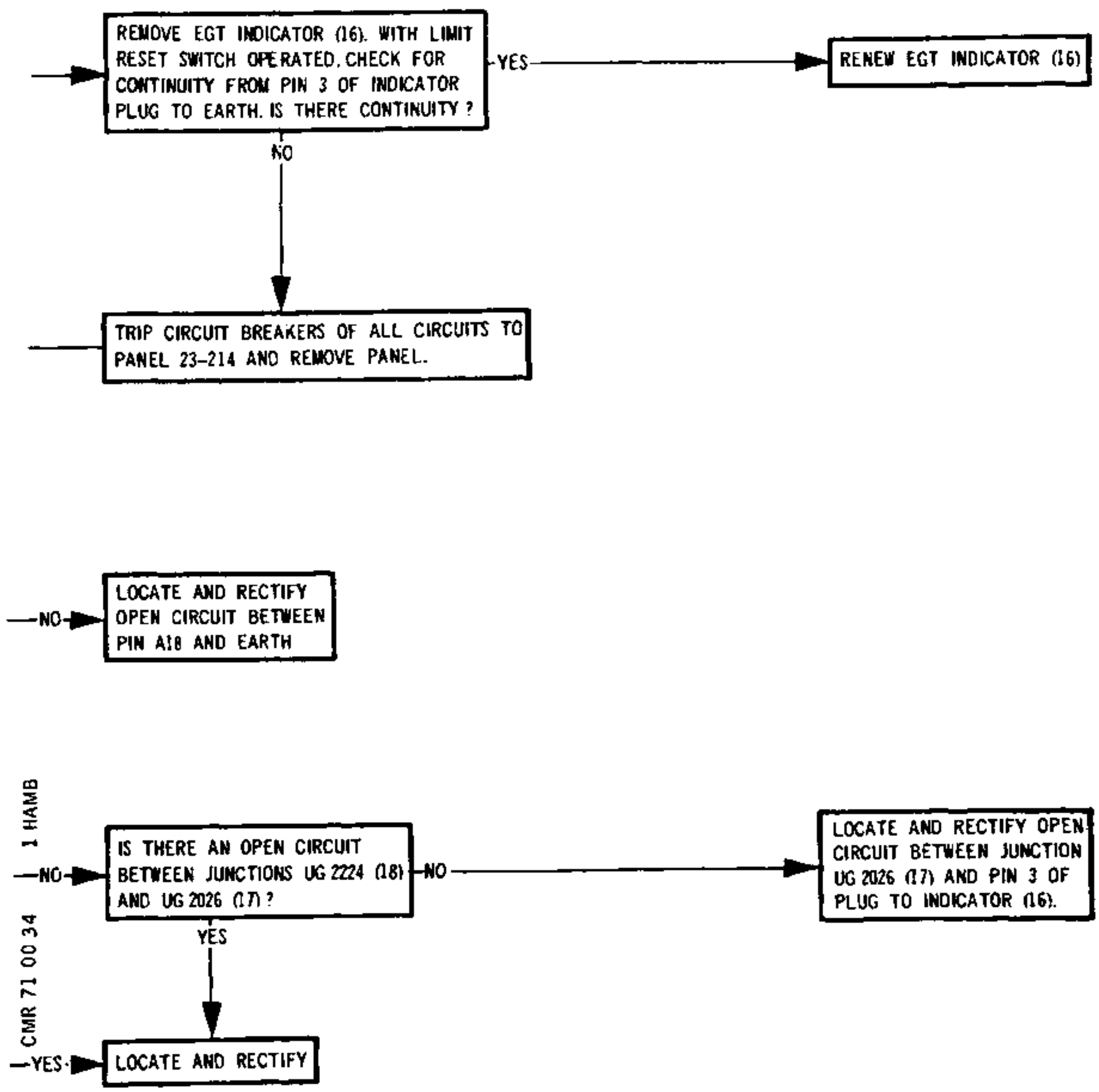


CMR 71 00 34 1 HAMA

Chart 108 (Sheet 1 of 2)

Printed in England

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (115 V.A.C.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 34 1 HAMB

Chart 108 (Sheet 2 of 2)

Printed in England

GROUND EQUIPMENT DESCRIPTION
GROUND POWER SUPPLY (28 V D.C.)
MULTI-TEST METER
TEST SET
CIRCUIT BREAKER SAFETY CLIPS.

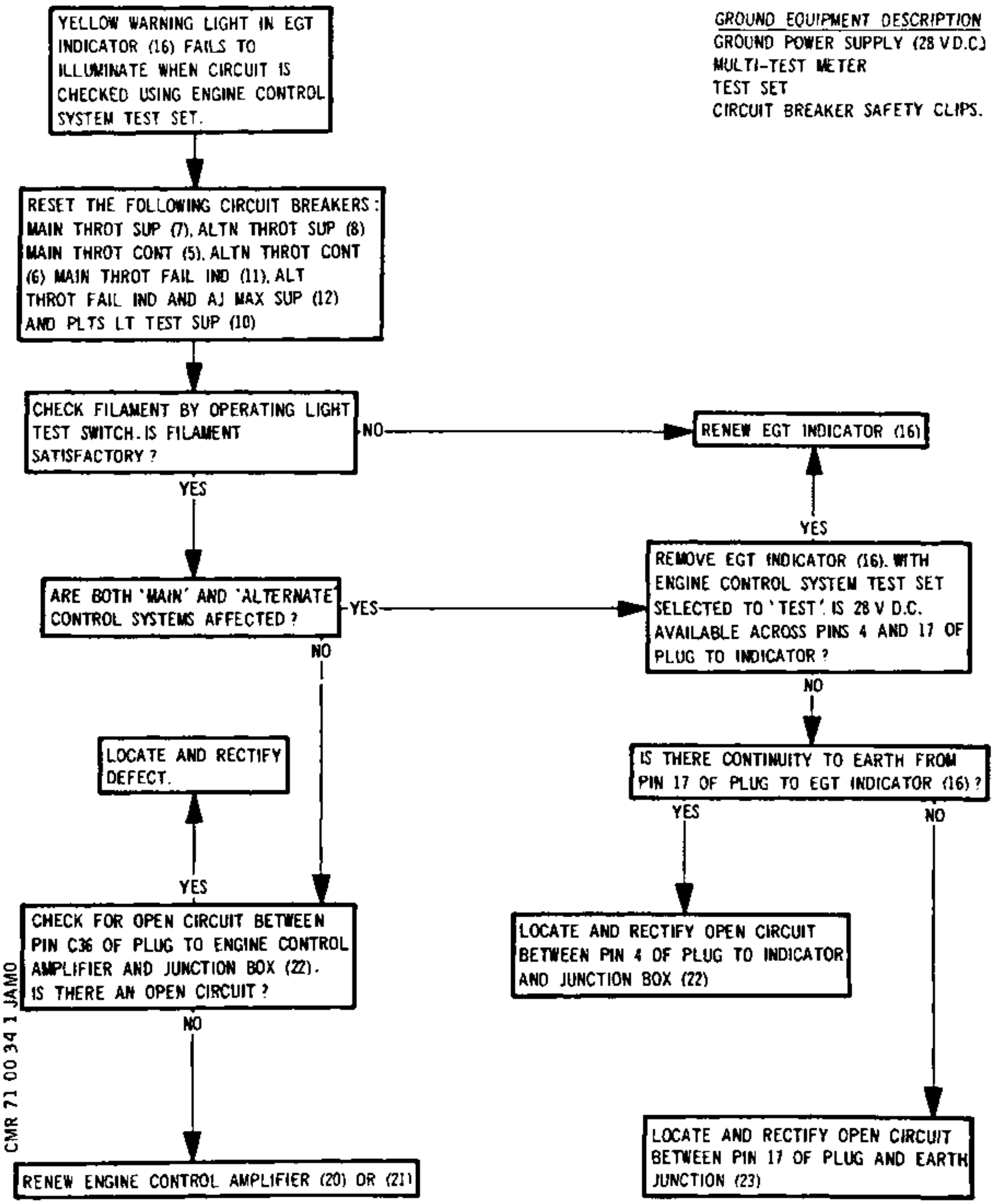
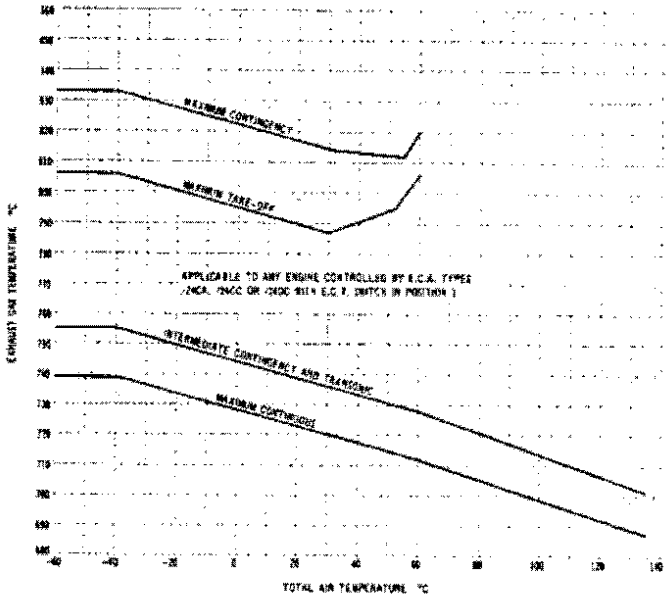
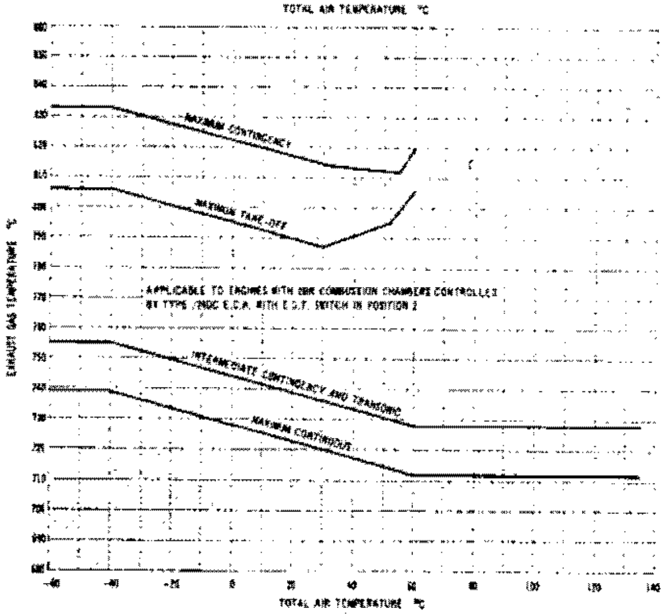


Chart 109

CR 35755/00B

EGT INDICATOR READING ABOVE PLACARD LIMIT GIVEN BELOW. THE ENGINE WILL GENERALLY BE AUTOMATICALLY CONTROLLED WITHIN THESE LIMITATIONS BUT IF NECESSARY, THE ENGINE SHOULD HAVE BEEN THROTTLED TO OBSERVE THEM. SUCH ACTION INDICATES AN INDICATION, ENGINE CONTROL SYSTEM, OR ENGINE MALFUNCTION.





CARRY OUT A FUNCTIONAL TEST OF THE EGT INDICATOR IN ACCORDANCE WITH 77-21-00 ADJUSTMENT TEST. IS TEST SATISFACTORY?

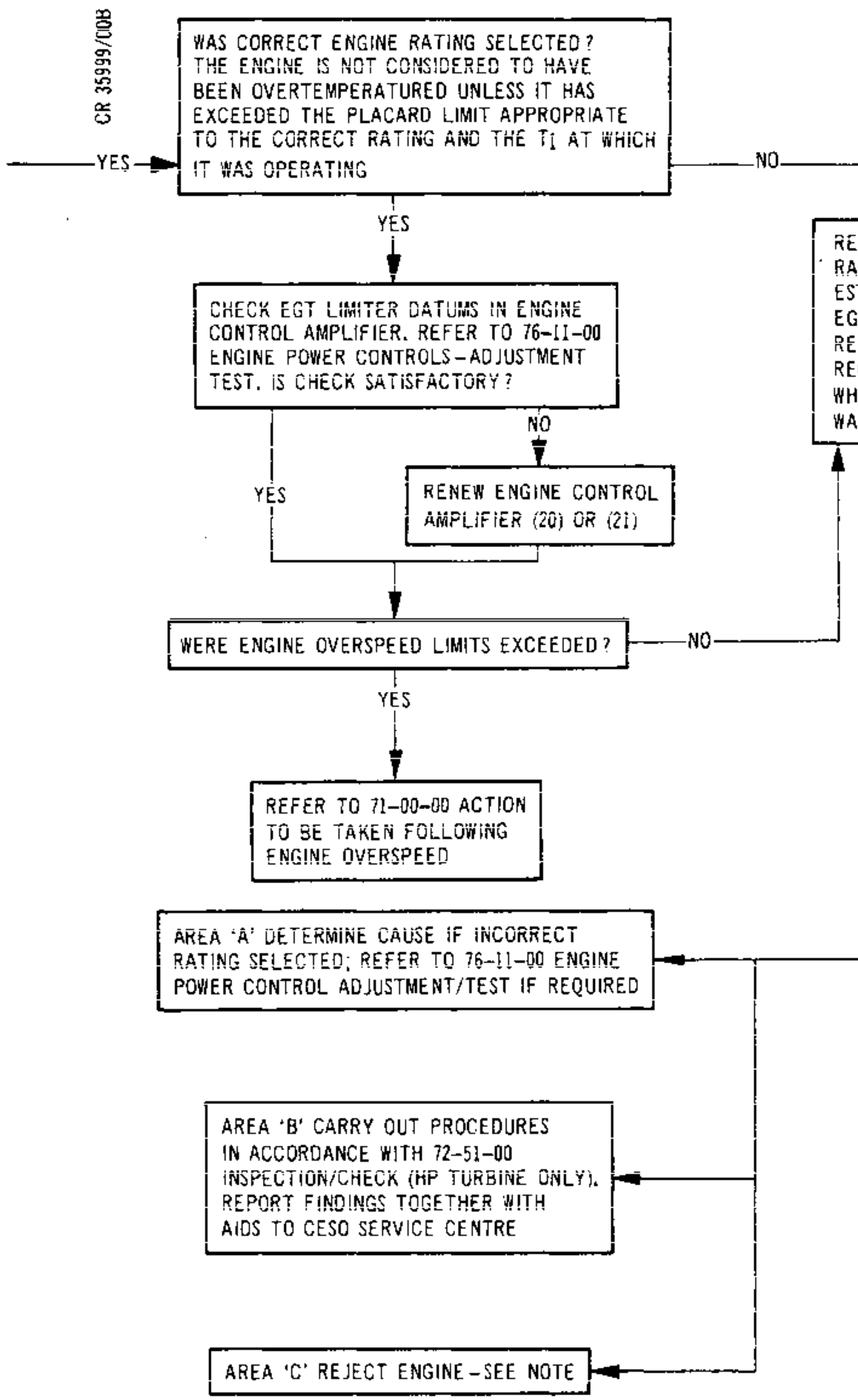
YES

NO

RENEW INDICATOR 71-00-34

R

Chart 110 (Sheet 1A of 4)



NOTE: OPERATORS MAY OPT FOR OPERATIONAL REASONS TO DELAY ENGINE REMOVAL PENDING A RECOMMENDATION FROM CESO SERVICE CENTRE WHO WILL REQUIRE AN AIDS READOUT AND HP TURBINE INSPECTION/CHECK (72-51-00) DETAILS. DO NOT RUN ENGINE UNTIL ASSESSMENT IS MADE

R

Chart 110 (Sheet 1B of 4)

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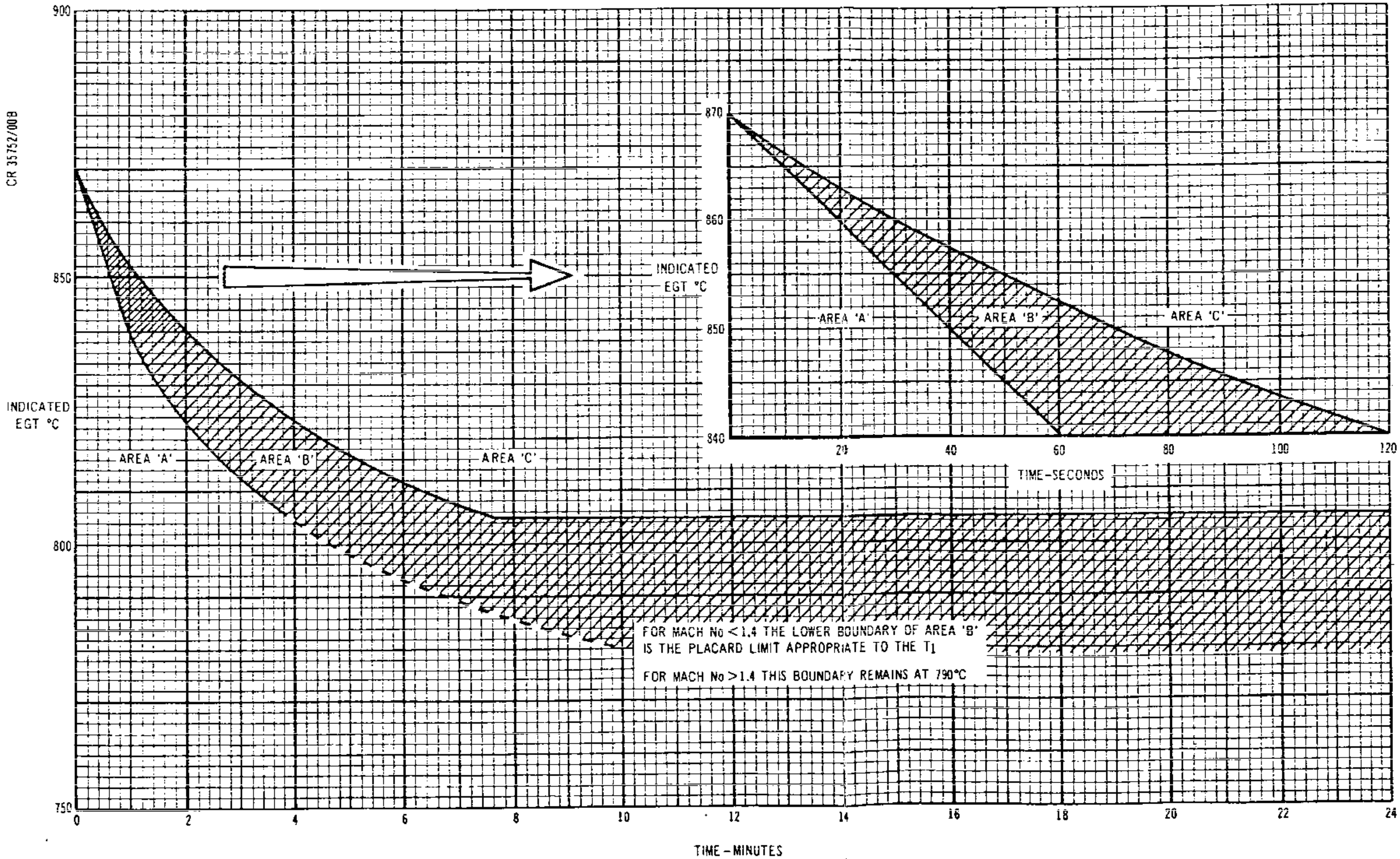
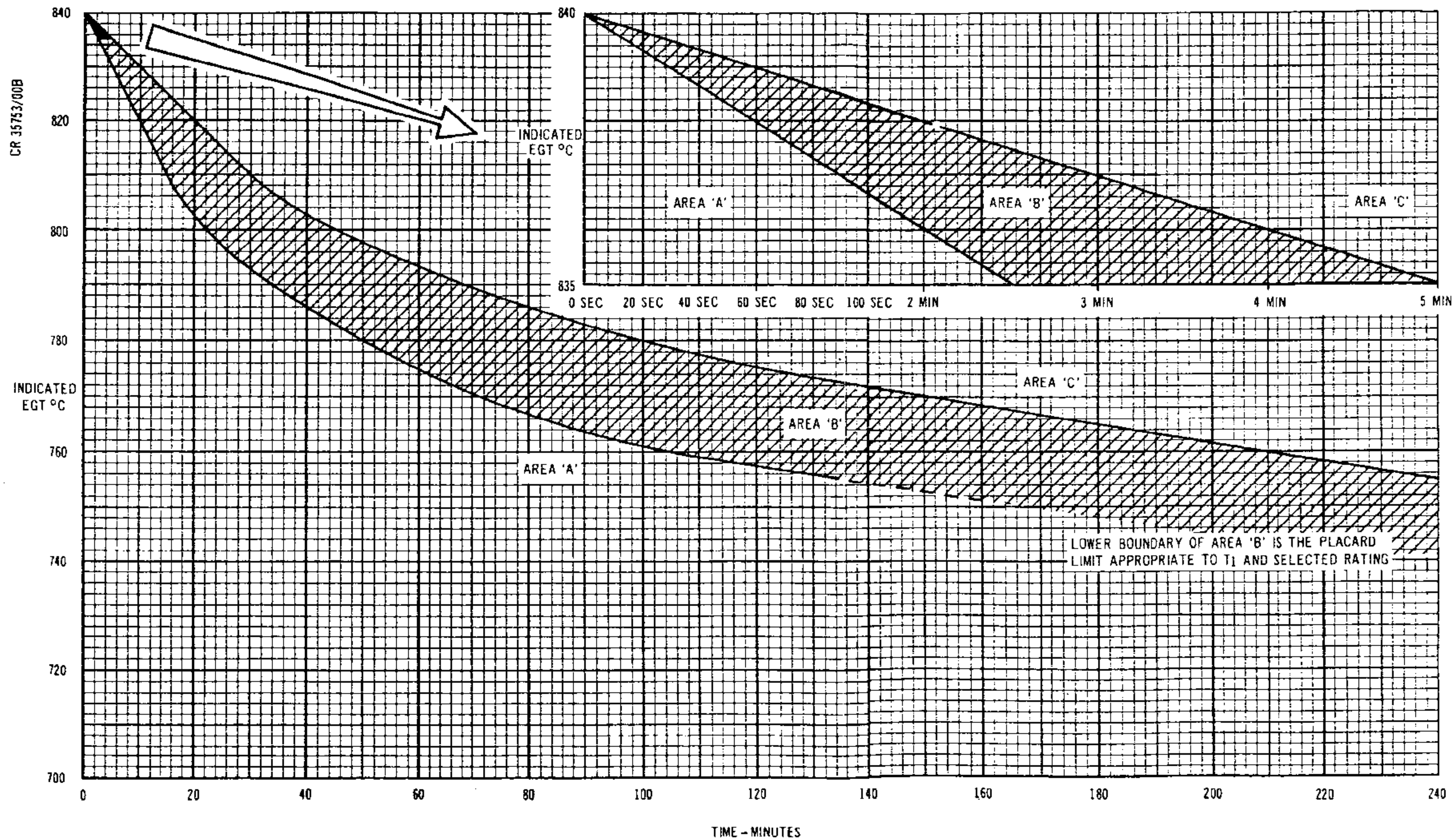


R Take-off Rating (Correct or Not)
Chart 110 (Sheet 2 of 4)



R Cruise or Climb Rating (Correct or Not)
Chart 110 (Sheet 3 of 4)
Chart 110 (Sheet 4 of 4) Deleted

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1						
(1) Circuit breaker 115 V	-	2-213	1E301	Map Ref. G12		
(2) Circuit breaker 115 V	-	4-213	1E151	Map Ref. D19		
(3) Circuit breaker 115 V	-	2-213	1E241	Map Ref. D10		
(4) Circuit breaker 26 V	-	04-213	D211	Map Ref. G3		
(5) Circuit breaker 28 V	-	3-213	1K3	Map Ref. A1		
(6) Circuit breaker 28 V	-	15-216	1K4	Map Ref. E8		
(7) Circuit breaker 115 V	-	2-213	1K1	Map Ref. F12		
(8) Circuit breaker 115 V	-	14-215	1K2	Map Ref. G12		
(9) Circuit breaker 28 V	-	5-213	1K1102	Map Ref. B3		
(10) Circuit breaker 28 V	-	15-215	L1001	Map Ref. E14		
(11) Circuit breaker 28 V	-	1-213	1K5	Map Ref. A1		
(12) Circuit breaker 28 V	-	3-213	1K6	Map Ref. B1		
(13) Jet pipe thermocouple harness	-	415/416	-	-	77-21-02	
(14) Engine thermocouple	-	416	-	-	77-22-08	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
ENGINE NO.1 termination junction box						
(15) Jet pipe thermocouple lead	-	416	-	-	77-21-03	
(16) EGT indi- cator	-	6-211	1E302	-	77-21-00	
(17) Junction UG2026	-	10-211	UG2026	-	77-21-00	
(18) Junction UG2224	-	9-214	UG2224	-	77-21-00	
(19) Limit reset switch	-	23-214	E391	-	77-21-00	
(20) Engine control amplifier (Main)	-	8-215	1K20	-	76-11-11	
(21) Engine control amplifier (Altern)	-	6-215	1K21	-	76-11-11	
(22) Junction box	-	8-215	UM2954	-	77-21-00	
(23) Earth junction	-	121	UG1025(2)	-	77-21-00	
(24) Fuel tank pressure indicator	-	15-214	D213	-	28-46-00	
ENGINE NO.2						
(1) Circuit breaker 115 V	-	2-213	2E301	Map Ref. B12		
(2) Circuit	-	4-213	2E151	Map Ref.		

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1 breaker 115 V				C19		
(3) Circuit breaker 115 V	-	2-213	2E241	Map Ref. D11		
(4) Circuit breaker 26 V	-	04-213	D211	Map Ref. G3		
(5) Circuit breaker 28 V	-	1-213	2K3	Map Ref. A3		
(6) Circuit breaker 28 V	-	15-215	2K4	Map Ref. F15		
(7) Circuit breaker 115 V	-	2-213	2K1	Map Ref. C12		
(8) Circuit breaker 115 V	-	13-215	2K2	Map Ref. F14		
(9) Circuit breaker 28 V	-	1-213	2K1102	Map Ref. F6		
(10) Circuit breaker 28 V	-	15-215	L1001	Map Ref. E14		
(11) Circuit breaker 28 V	-	3-213	2K5	Map Ref. A3		
(12) Circuit breaker 28 V	-	1-213	2K6	Map Ref. B3		
(13) Jet pipe thermocouple harness	-	425/426	-	-	77-21-02	
(14) Engine thermocouple termination junction box	-	426	-	-	77-22-08	
(15) Jet pipe thermocouple lead	-	426	-	-	77-21-03	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
ENGINE NO.1						
(16) EGT indicator	-	6-211	2E302	-	77-21-00	
(17) Junction UG2026	-	10-211	UG2026	-	77-21-00	
(18) Junction UG2224	-	9-214	UG2224	-	77-21-00	
(19) Limit reset switch	-	23-214	E391	-	77-21-00	
(20) Engine control amplifier (Main)	-	6-215	2K20	-	76-11-11	
(21) Engine control amplifier (Altern)	-	8-215	2K21	-	76-11-11	
(22) Junction box	-	6-215	UM2952	-	77-21-00	
(23) Earth junction	-	121	UG1025(3)	-	77-21-00	
(24) Fuel tank pressure indicator	-	15-214	D213	-	28-46-00	
ENGINE NO.3						
(1) Circuit breaker 115 V	-	2-213	3E301	Map Ref. B13		
(2) Circuit breaker 115 V	-	4-213	3E151	Map Ref. C20		
(3) Circuit breaker 115 V	-	2-213	3E241	Map Ref. D12		
(4) Circuit breaker 26 V	-	04-213	D211	Map Ref. G3		

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1						
(5) Circuit breaker 28 V	-	1-213	3K3	Map Ref. A4		
(6) Circuit breaker 28 V	-	15-215	3K4	Map Ref. F16		
(7) Circuit breaker 115 V	-	2-213	3K1	Map Ref. C13		
(8) Circuit breaker 115 V	-	13-216	3K2	Map Ref. C5		
(9) Circuit breaker 28 V	-	1-213	3K1102	Map Ref. F7		
(10) Circuit breaker 28 V	-	15-215	L1001	Map Ref. E14		
(11) Circuit breaker 28 V	-	3-213	3K5	Map Ref. A4		
(12) Circuit breaker 28 V	-	1-213	3K6	Map Ref. B4		
(13) Jet pipe thermocouple harness	-	435/436	-	-	77-21-02	
(14) Engine thermocouple termination junction box	-	436	-	-	77-22-08	
(15) Jet pipe thermocouple lead	-	436	-	-	77-21-03	
(16) EGT indicator	-	6-211	3E302	-	77-21-00	
(17) Junction UG2026	-	10-211	UG2026	-	77-21-00	
(18) Junction	-	9-214	UG2224	-	77-21-00	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1 UG2224						
(19) Limit reset switch	-	23-214	E391	-	77-21-00	
(20) Engine control amplifier (Main)	-	8-216	3K20	-	76-11-11	
(21) Engine control amplifier (Altern)	-	6-216	3K21	-	76-11-11	
(22) Junction box	-	8-216	UM2955	-	77-21-00	
(23) Earth junction	-	121	UG1025(4)	-	77-21-00	
(24) Fuel tank pressure indicator	-	15-214	D213	-	28-46-00	
ENGINE NO.4						
(1) Circuit breaker 115 V	-	2-213	4E301	Map Ref. G13		
(2) Circuit breaker 115 V	-	4-213	4E151	Map Ref. D20		
(3) Circuit breaker 115 V	-	2-213	4E241	Map Ref. D13		
(4) Circuit breaker 26 V	-	04-213	D211	Map Ref. G3		
(5) Circuit breaker 28 V	-	3-213	4K3	Map Ref. A4		
(6) Circuit breaker 28 V	-	15-216	4K4	Map Ref. F9		

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1						
(7) Circuit breaker 115 V	-	2-213	4K1	Map Ref. F13		
(8) Circuit breaker 115 V	-	14-215	4K2	Map Ref. C7		
(9) Circuit breaker 28 V	-	5-213	4K1102	Map Ref. B4		
(10) Circuit breaker 28 V	-	15-215	L1001	Map Ref. E14		
(11) Circuit breaker 28 V	-	1-213	4K5	Map Ref. A2		
(12) Circuit breaker 28 V	-	3-213	4K6	Map Ref. B2		
(13) Jet pipe thermocouple harness	-	445/446	-	-	77-21-02	
(14) Engine thermocouple termination junction box	-	446	-	-	77-22-08	
(15) Jet pipe thermocouple lead	-	446	-	-	77-21-03	
(16) EGT indicator	-	6-211	4E302	-	77-21-00	
(17) Junction UG2026	-	10-211	UG2026	-	77-21-00	
(18) Junction UG2224	-	9-214	UG2224	-	77-21-00	
(19) Limit reset switch	-	23-214	E391	-	77-21-00	
(20) Engine	-	6-216	4K20	-	76-11-11	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
ENGINE NO.1 control amplifier (Main)						
(21) Engine control amplifier (Altern)	-	8-216	4K21	-	76-11-11	
(22) Junction box	-	6-216	UM2953	-	77-21-00	
(23) Earth junction	-	121	UG1025(5)	-	77-21-00	
(24) Fuel tank pressure indicator	-	15-214	D213	-	28-46-00	

Component Identification
Table 101

JET PIPE PRESSURE (P7) INDICATION - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. para.3.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

The four engine jet pipe (P7) indication systems are similar, therefore the procedures and charts are applicable to all four. Where two or more identical components are involved, that is, one in each circuit, all references to the associated components listed in Table 101 are given, for example, 'Renew Circuit Breaker (1), (2), (3) or (4)'.

2. Preparation

R A. Ensure that the P7 supply pipe to the transmitter is free
R from leaks and blockage. (Ref. Adjustment/Test).

B. Ensure that the associated circuit breakers are set (Ref. Table 101).

C. Make available electrical ground power as detailed in 24-41-00.

D. Gain access to the No.1, 2, 3 or 4 P7 transmitter as required.

3. Trouble Shooting

```
A.********************************************
  *Prepare to trouble shoot (Ref. para.2.). *
  *Check that under static conditions the   *
  *dial pointer reads in accordance with    *
  *ambient pressure (15 psia approx.), and  *
  *that the failure warning flag is         *
  *withdrawn completely.  If necessary,     *
  *trouble shoot the bug in accordance with *
  *71-10-37, Trouble Shooting. IF -         *
  ******************************************
                |      |
                |      |         -----------------------------------
                |      |        |1. Indicator dial pointer remains  |
               OK    NOT OK-----|   at zero, or reads incorrectly or|
                |               |   sluggishly, but failure flag is |
                |               |   withdrawn - Chart 101.          |
                |               |2. Indicator dial pointer remains  |
                |               |   at zero and failure flag is not |
                |               |   withdrawn - Chart 102.          |
                |                -----------------------------------
                |
B.********************************************
  *Check that with engine running, or under *
  *test conditions, the indicator dial      *
  *pointer reads according to power setting,*
  *or agrees with reading on test set. IF - *
  ******************************************
                |      |
                |      |         -----------------------------------
                |      |        |Dial pointer does not move past    |
               OK    NOT OK-----|ambient position, or moves slowly  |
                |               |and reads incorrectly - check for  |
                |               |leaks and obstruction (Ref.        |
                |               |Adjustment/Test and 77-12-12,      |
                |               |Removal/Installation).             |
                |                -----------------------------------
                |
```

```
                    |
C.*******************************************
  *Switch off and disconnect electrical     *
  *ground power as detailed in 24-41-00;    *
R *check that the dial pointer reads ambient*
  *and the failure warning flag obscures the*
  *first two digits in the counter aperture.*
  *IF -                                     *
  *******************************************
                    |
                    |              -----------------------------------
                    |             |Renew Indicator (9), (10), (11) or |
                 NOT OK-----------|(12).                              |
                                   -----------------------------------
```

```
********************************
*UNDER STATIC CONDITIONS,      *
*INDICATOR DIAL POINTER        *
*REMAINS AT ZERO, OR READS     *
*INCORRECTLY OR SLUGGISHLY,    *
*BUT FAILURE FLAG IS           *
*WITHDRAWN.                    *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
    -----------------         -----------------         -----------------
   |Does dial pointer|       |Check for 28 V   |       |Renew CB (5),    |
   |remain at zero?  |-YES-  |d.c. output from |--NO-  |(6), (7) or (8). |
    -----------------        |CB (5), (6), (7) |        -----------------
           |                 |or (8).          |
           NO                 -----------------
           |                         |
           |                        YES
           |                         |
    -----------------         -----------------
   |Does dial pointer|       |Renew Transmitter|
R  |read ambient     |-YES-  |(13), (14), (15) |
R  |incorrectly or   |       |or (16). Is fault|
R  |sluggishly?      |       |cleared?         |
R   -----------------         -----------------
                                     |
                                     NO
                                     |
                              -----------------
                             |Renew Indicator  |
                             |(9), (10), (11)  |
                             |or (12).         |
                              -----------------
```

Chart 101

```
********************************
*INDICATOR DIAL POINTER        *
*REMAINS AT ZERO AND FAILURE   *
*FLAG IS NOT WITHDRAWN.        *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
 -----------------          -----------------
|Check for 115 V  |        |Renew CB (1),    |
|a.c. output from |--NO-|(2), (3) or (4). |
|CB (1), (2), (3) |         -----------------
|or (4).          |
 -----------------
         |
        YES
         |
 -----------------          ------------------
|Renew Indicator  |        |Locate and rectify|
|(9), (10), (11)  |--NO-|O/C in wiring     |
|or (12).  Is     |        |between CB (1),   |
|fault cleared?   |        |(2), (3) or (4)   |
 -----------------         |and Indicator (9),|
                           |(10), (11) or     |
                           |(12).             |
                            ------------------
                            Chart 102
```

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(1) Circuit breaker 115 V	-	14-215	1E261	Map ref.D13	24-50-00 R/I	77-12-01
(2) Circuit breaker 115 V	-	13-215	2E261	Map ref.C14	24-50-00 R/I	77-12-01
(3) Circuit breaker 115 V	-	13-216	3E261	Map ref.C7	24-50-00 R/I	77-12-01
(4) Circuit breaker 115 V	-	14-216	4E261	Map ref.B7	24-50-00 R/I	77-12-01
(5) Circuit breaker 28 V	-	15-216	1E262	Map ref.B9	24-50-00 R/I	77-12-01
(6) Circuit breaker 28 V	-	15-215	2E262	Map ref.A15	24-50-00 R/I	77-12-01
(7) Circuit breaker 28 V	-	15-215	3E262	Map ref.A16	24-50-00 R/I	77-12-01
(8) Circuit breaker 28 V	-	15-216	4E262	Map ref.B10	24-50-00 R/I	77-12-01
(9) No.1 engine P7 indicator	-	4-214	1E263	3CM station	77-12-11 R/I	77-12-01
(10) No.2 engine P7 indicator	-	4-214	2E263	3CM station	77-12-11 R/I	77-12-01
(11) No.3 engine P7 indicator	-	4-214	3E263	3CM station	77-12-11 R/I	77-12-01
(12) No.4 engine P7 indicator	-	4-214	4E263	3CM station	77-12-11 R/I	77-12-01
(13) No.1 engine P7 transmitter	536-BT	-	1E264	Wing bottom panel	77-12-12 R/I	77-12-01
(14) No.2	535-BT	-	2E264	Wing	77-12-12	77-12-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
engine P7 transmitter				bottom panel	R/I	
(15) No.3 engine P7 transmitter	635-BT	-	3E264	Wing bottom panel	77-12-12 R/I	77-12-01
(16) No.4 engine P7 transmitter	636-BT	-	4E264	Wing bottom panel	77-12-12 R/I	77-12-01

Component Identification
Table 101

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LP (N1) AND HP (N2) rpm INDICATION - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. para.3.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

The four LP (N1) and HP (N2) rpm indication systems are similar, therefore the procedures and charts are applicable to all four. Where two or more identical components are involved, that is, one in each circuit, all references to the associated components listed in Table 101 are given. for example, "Renew Circuit Breaker (1), (2), (3) or (4)".

2. Preparation

A. Ensure that the associated circuit breakers are set (Ref. Table 101, items (1) to (4), N1 circuit; items (13) to (16), N2 circuit).

B. Make available electrical ground power as detailed in 24-41-00.

C. Gain access to the engine left or right gearbox as required.

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D. Test the indicator integral lighting (Ref. 33-17-00).

R NOTE: For rpm probe insulation and resistance tests refer to 71-50-00, Adjustment/Test.

3. Trouble Shooting

```
A.******************************************
  *Prepare to trouble shoot (Ref. para.2.).*
  *Check that the indicator main dial      *
  *pointer and counter read zero, the N1   *
R *overspeed pointer is at the 108.5 per   *
  *cent position, the N2 overspeed pointer *
R *is at the 110 per cent position, and the*
  *failure warning flag is withdrawn       *
  *completely.  IF -                       *
  ******************************************
            |    |
            |    |                -----------------------------------
            |    |               |1. Indicator dial pointer and      |
            OK   NOT OK------|   counter remain at zero, or read |
            |                    |   incorrectly or sluggishly, but  |
            |                    |   failure flag is withdrawn -     |
            |                    |   Chart 101.                      |
            |                    |2. Indicator dial pointer and      |
            |                    |   counter remain at zero and      |
            |                    |   failure flag is not withdrawn - |
            |                    |   Chart 102.                      |
            |                    |3. Overspeed pointer does not reset|
            |                    |   when LIMIT RESET push-switch is |
            |                    |   operated - Chart 103.           |
            |                     -----------------------------------
            |
B.******************************************
  *Switch off and disconnect electrical    *
  *ground power as detailed in 24-41-00;   *
  *check that the indicator dial pointer   *
  *and counter read zero and the failure   *
  *warning flag obscures the first two     *
  *digits in the counter aperture.  IF -   *
  ******************************************
                 |
                 |                -----------------------------------
                 |               |Renew Indicator (5), (6), (7) or   |
                 NOT OK------|(8) (N1); (17), (18), (19) or (20) |
                                 |(N2).                              |
                                  -----------------------------------
```


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```
********************************        --------------------------------
*INDICATOR DIAL POINTER AND    *       |GROUND EQUIPMENT REQUIRED       |
*COUNTER REMAIN AT ZERO, OR    *       |--------------------------------|
*READ INCORRECTLY OR           *       |DESCRIPTION           PART NO.  |
*SLUGGISHLY, BUT FAILURE FLAG  *       |--------------------------------|
*IS WITHDRAWN.                 *       |GROUND POWER SUPPLY   -         |
********************************        --------------------------------
```

NOTE: Before renewal of components (*), check the preceding run of wiring for continuity.

```
 -----------------            -----------------           ----------------
|Do dial pointer  |          |Check for 115 V  |         |Renew CB (1),    |
|and counter remain|-YES-    |a.c. output from |--NO-    |(2), (3) or (4)  |
|at zero?         |          |CB (1), (2), (3) |         |(N1); (13),      |
 -----------------           |or (4) (N1); (13)|         |(14), (15) or    |
        |                    |(14), (15) or    |         |(16) (N2).       |
        |                    |(16) (N2).       |          ----------------
        |                     -----------------
        |                            |
        |                           YES
        |                            |
        |                     -----------------
       NO                    |Renew Indicator  |
        |                    |(5), (6), (7) or |
        |                    |(8) (N1); (17),  |
        |                    |(18), (19) or    |
        |                    |(20) (N2).  Is   |
        |                    |fault cleared?   |
        |                     -----------------
        |                            |
        |                           NO
        |                            |
 -----------------            -----------------
|DO dial pointer  |          |*Renew rpm Probe |
|and counter read |          |(9), (10), (11)  |
|incorrectly or   |-YES-     |or (12) (N1);    |
|sluggishly?      |          |(21), (22), (23) |
 -----------------           |or (24) (N2).    |
                              -----------------
```

Chart 101

```
********************************     ------------------------------
*INDICATOR DIAL POINTER AND    *    |GROUND EQUIPMENT REQUIRED     |
*COUNTER REMAIN AT ZERO AND    *    |------------------------------|
*FAILURE FLAG IS NOT           *    |DESCRIPTION          PART NO. |
*WITHDRAWN.                    *    |------------------------------|
********************************    |GROUND POWER SUPPLY  -        |
                                    |MULTIMETER           -        |
                                     ------------------------------

 ----------------          ----------------
|Check for 115 V |        |Renew CB (1),    |
|a.c. output from|--NO-|(2), (3) or (4)  |
|CB (1), (2), (3) |        |(N1); (13), (14) |
|or (4) (N1); (13)|        |(15) or (16) (N2)|
|(14), (15) or    |         ----------------
|(16) (N2).       |
 ----------------
        |
       YES
        |
 ----------------          -----------------
|Renew Indicator  |       |Locate and rectify|
|(5), (6), (7) or |--NO-|O/C in wiring     |
|(8) (N1);  (17), |       |between (a) CB (1)|
|(18), (19) or    |       |(2), (3) or (4)   |
|(20) (N2).  Is   |       |and Indicator (5),|
|fault cleared?   |       |(6), (7) or (8)   |
 ----------------         |(N1); (b) CB (13) |
                          |(14), (15) or (16)|
                          |and Indicator (17)|
                          |(18), (19) or (20)|
                          |(N2).             |
                           -----------------
```

Chart 102

```
********************************      ----------------------------------
*OVERSPEED POINTER DOES NOT   *      |GROUND EQUIPMENT REQUIRED          |
*RESET WHEN 'LIMIT RESET'     *      |-----------------------------------|
*PUSH-SWITCH IS OPERATED.     *      |DESCRIPTION             PART NO.   |
********************************      |-----------------------------------|
                                     |GROUND POWER SUPPLY      -         |
                                     |MULTIMETER               -         |
                                      ----------------------------------

 -----------------         -----------------
|With Reset Switch|       |Renew Indicator  |
|(25) pressed,    |-YES-|(5), (6), (7) or |
|check for conti- |       |(8) (N1); (17),  |
|nuity between    |       |(18), (19) or    |
|pins 1 and 2 of  |       |(20) (N2).       |
|Switch (25).     |        -----------------
 -----------------
         |
         NO
         |
 -----------------         -----------------
|Renew Switch (25)|       |Check for O/C    |
|Is fault cleared?|--NO-|between Switch   |
 -----------------        |(25) and Indi-   |
                          |cator (5), (6),  |
                          |(7) or (8) (N1); |
                          |(17), (18), (19) |
                          |or (20) (N2).    |
                           -----------------
```

Chart 103

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
N1 CIRCUIT						
(1) Circuit breaker 115 V	-	4-213	1E151	Map ref.E18	24-50-00 R/I	77-11-01
(2) Circuit breaker 115 V	-	4-213	2E151	Map ref.C19	24-50-00 R/I	77-11-01
(3) Circuit breaker 115 V	-	4-213	3E151	Map ref.C20	24-50-00 R/I	77-11-01
(4) Circuit breaker 115 V	-	4-213	4E151	Map ref.E19	24-50-00 R/I	77-11-01
(5) No.1 engine N1 indicator	-	6-211	1E152	Centre instr. panel	77-11-11 R/I	77-11-01
(6) No.2 engine N1 indicator	-	6-211	2E152	Centre instr. panel	77-11-11 R/I	77-11-01
(7) No.3 engine N1 indicator	-	6-211	3E152	Centre instr. panel	77-11-11 R/I	77-11-01
(8) No.4 engine N1 indicator	-	6-211	4E152	Centre instr. panel	77-11-11 R/I	77-11-01
(9) No.1 engine rpm probe	-	415	E153	No.1 engine gearbox	76-12-01 R/I	11-11-01
(10) No.2 engine rpm probe	-	426	E153	No.2 engine gearbox	76-12-01 R/I	77-11-01
(11) No.3 engine rpm probe	-	435	E153	No.3 engine gearbox	76-12-01 R/I	77-11-01
(12) No.4 engine rpm probe	-	446	E153	No.4 engine gearbox	76-12-01 R/I	77-11-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
N2 CIRCUIT						
(13) Circuit breaker 115 V	-	2-213	1E241	Map ref.G10	24-50-00 R/I	77-11-04
(14) Circuit breaker 115 V	-	2-213	2E241	Map ref.D12	24-50-00 R/I	77-11-04
(15) Circuit breaker 115 V	-	2-213	3E241	Map ref.D13	24-50-00 R/I	77-11-04
(16) Circuit breaker 115 V	-	2-213	4E241	Map ref.G11	24-50-00 R/I	77-11-04
(17) No.1 engine N2 indicator	-	6-211	1E242	Centre instr. panel	77-11-11 R/I	77-11-04
(18) No.2 engine N2 indicator	-	6-211	2E242	Centre instr. panel	77-11-11 R/I	77-11-04
(19) No.3 engine N2 indicator	-	6-211	3E242	Centre instr. panel	77-11-11 R/I	77-11-04
(20) No.4 engine N2 indicator	-	6-211	4E242	Centre instr. panel	77-11-11 R/I	77-11-04
(21) No.1 engine rpm probe	-	415	E243	No.1 engine gearbox	76-12-02 R/I	77-11-04
(22) No.2 engine rpm probe	-	426	E243	No.2 engine gearbox	76-12-02 R/I	77-11-04
(23) No.3 engine rpm probe	-	435	E243	No.3 engine gearbox	76-12-02 R/I	77-11-04
(24) No.4 engine rpm	-	446	E243	No.4 engine gearbox	76-12-02 R/I	77-11-04

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
probe						
COMMON						
(25) Reset push-switch	-	23-214	E391	3CM station	77-11-00 R/I	77-11-81

Component Identification
Table 101

POWER PLANT CONFIGURATION INDICATION - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. para.3.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

The four power plant configuration warning circuits are similar, therefore the procedures and charts are applicable to all four. Where identical components are involved, that is, one in each circuit, all references to the associated components listed in Table 101 are given, for example, 'Renew Circuit Breaker (1), (2), (3) or (4)'.

2. Preparation

A. Ensure that the associated circuit breakers are set (Ref. Table 101, items (1), (2), (3), (4), (31), (32), (33), (34) and (45)).

B. Make available electrical ground power as detailed in 24-41-00.

C. Ensure that the primary and secondary nozzles operate in the correct sense, and in accordance with associated

control settings (Ref. Chap.78).

D. Physically open and close the primary nozzle to obtain the necessary AJ indicator readings (AJ max. and AJ min.).

E. Test the warning caption filaments (Ref. 33-14-00).

3. Trouble Shooting

A. Prepare to trouble shoot (Ref. para.2.). Check that with the landing gear weight switch relay energized (aircraft weight on the landing gear) and throttle control set to forward thrust, the T/O MONITOR arming switch holds in when pressed, and is released when power supplies are disconnected by switching action, or landing gear weight switch relay is de-energized (simulated flight condition, Ref. Chap.32). IF -

NOT OK —
1. T/O MONITOR arming switch not held in when pressed - Chart 101.
2. T/O MONITOR arming switch not released when power supply is interrupted by switching action, or landing gear weight switch relay is de-energized - Chart 102.

OK

B. Check that with forward thrust selected, the T/O MONITOR arming switch pressed, landing gear weight switch relay energized, secondary nozzle setting correct (between 12 and 26 per cent), and fuel flow rate and P7 indicator bugs set correctly, the green 'go' light is illuminated. IF -

NOT OK — Green 'go' light is not illuminated - Chart 103.

OK

C. Check that CON caption is not illuminated during forward thrust with or without reheat selected. IF -

NOT OK —
1. CON caption illuminated with reheat not selected and secondary nozzle switch closed - renew Diode (23), (24), (25) or (26).
2. CON caption illuminated with reheat selected - trouble shoot reheat control circuit (Ref. 71-00-49).

OK

CMB7100371AAMA

OK

D. With reverse thrust selected, and the NOZ AIR SOV & WIND DOWN TEST SWITCH, for the appropriate pair of engines, set to A, check that after approx. 5 s, with the AJ indicator dial pointer reading greater than 15 per cent area, the CON caption is illuminated; with the AJ indicator dial pointer reading less than 15 per cent area the CON caption is extinguished.
IF -

NOT OK

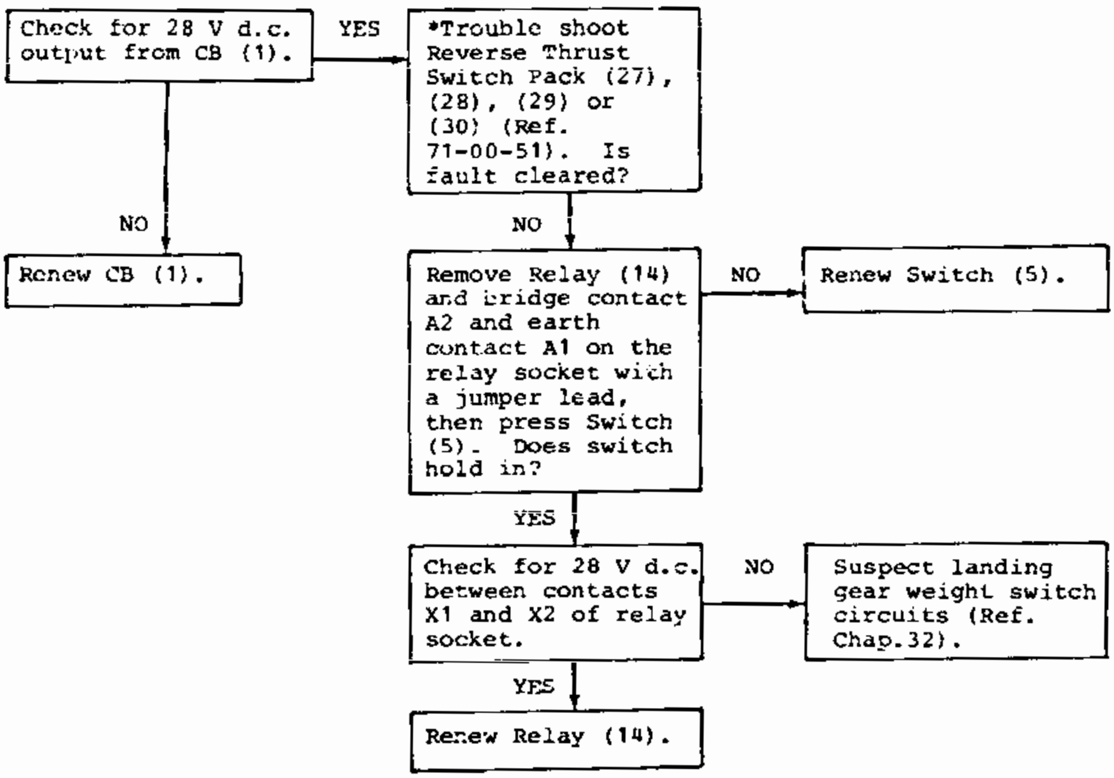
1. CON caption not illuminated with AJ indicator reading greater than 15 per cent area - Chart 104.
2. CON caption illuminated with AJ indicator reading less than 15 per cent area - renew Indicator (41), (42), (43) or (44).
3. CON caption illuminated immediately test switch is operated - renew AJ Min. Fail Relay (37), (38), (39) or (40).

CMB71003711AAMB

T/O MONITOR ARMING SWITCH DOES NOT HOLD IN WHEN PRESSED.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the preceding run of wiring for continuity.



CMB7100371BAM0

Chart 101

T/O MONITOR ARMING SWITCH NOT RELEASED WHEN POWER SUPPLY INTERRUPTED BY SWITCHING ACTION, OR LANDING GEAR WEIGHT SWITCH RELAY IS DE-ENERGIZED.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

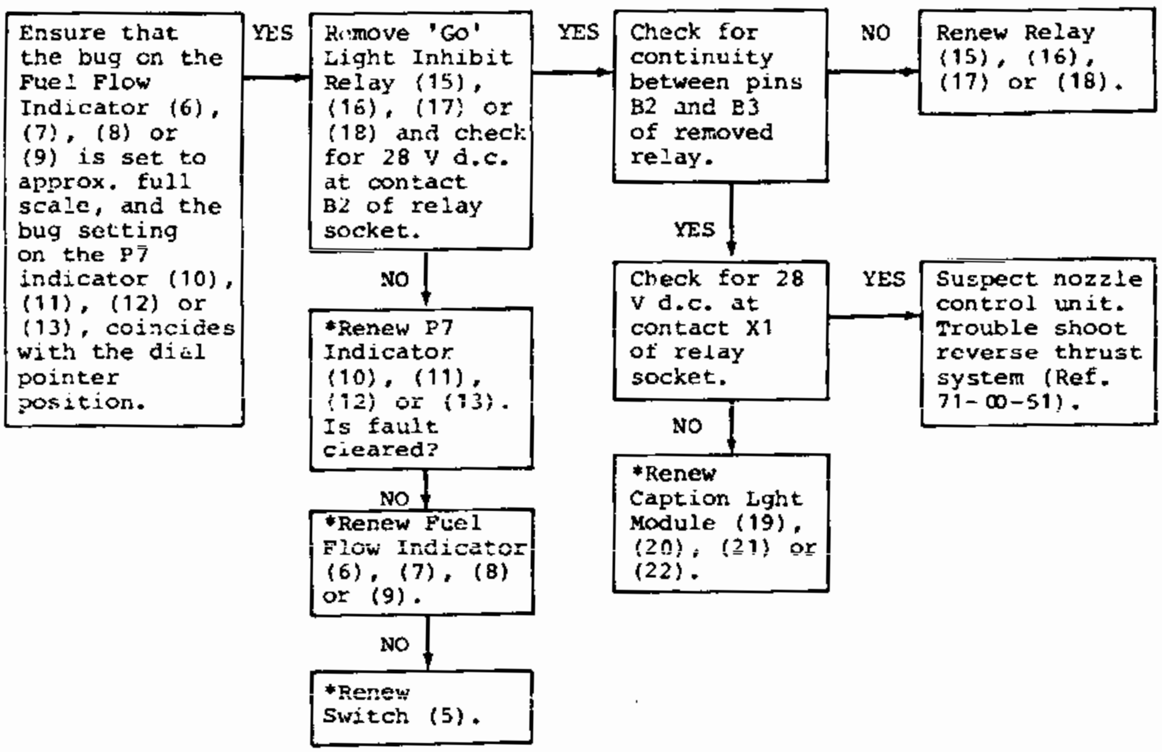
Remove Relay (14). Is switch released?
- YES: Suspect Relay (14) or landing gear weight switch circuits (Ref. Chap.32).
- NO: Trip CB (1). Is switch released?
  - YES: Check for earth fault between Switch (5) and Relay (14). Rectify as necessary.
  - NO: Renew Switch (5).

Chart 102

WITH FORWARD THRUST SELECTED, SECONDARY NOZZLE POSITION CORRECT AND T/O MONITOR ARMING SWITCH PRESSED, THE GREEN 'GO' LIGHT IS NOT ILLUMINATED.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the preceding run of wiring for continuity.



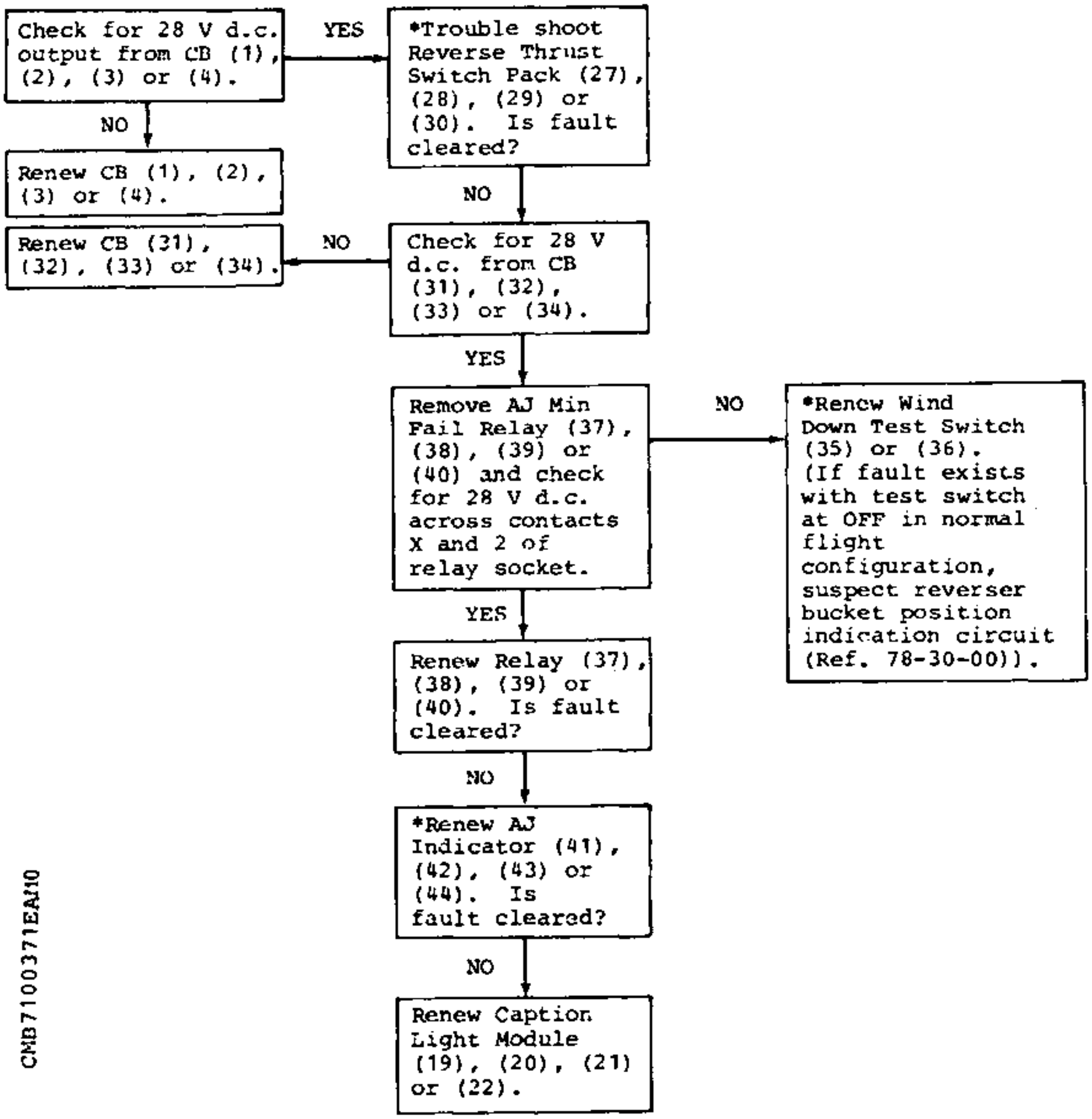
CMB7100371DAM0

Chart 103

'CON' CAPTION NOT ILLUMINATED WITH AJ INDICATOR READING GREATER THAN 15 PER CENT AREA AND POSITION 'A' SELECTED ON WIND-DOWN TEST SWITCH.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the preceding run of wiring for continuity.



CMB7100371EA10

Chart 104

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(1) No.1 engine circuit breaker 28 V	-	5-213	1E461	Map ref.D1	24-50-00 R/I	77-13-01
(2) No.2 engine circuit breaker 28 V	-	1-213	2E461	Map ref.E3	24-50-00 R/I	77-13-01
(3) No.3 engine circuit breaker 28 V	-	1-213	3E461	Map ref.E4	24-50-00 R/I	77-13-01
(4) No.4 engine circuit breaker 28 V	-	5-213	4E461	Map ref.D2	24-50-00 R/I	77-13-01
(5) Take-off monitor arming switch	-	6-211	E462	Centre instr. panel	77-13-00 R/I	77-13-01
(6) No.1 engine fuel flow indicator	-	6-211	1E476	Centre instr. panel	73-33-11 R/I	73-33-01
(7) No.2 engine fuel flow indicator	-	6-211	2E476	Centre instr. panel	73-33-11 R/I	73-33-01
(8) No.3 engine fuel flow indicator	-	6-211	3E476	Centre instr. panel	73-33-11 R/I	73-33-01
(9) No.4 engine fuel flow indicator	-	6-211	4E476	Centre instr. panel	73-33-11 R/I	73-33-01
(10) No.1 engine P7 indicator	-	4-214	1E263	3CM station	77-12-11 R/I	77-12-01
(11) No.2 engine P7 indicator	-	4-214	2E263	3CM station	77-12-11 R/I	77-12-01
(12) No.3	-	4-214	3E263	3CM station	77-12-11	77-12-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
engine P7 indicator					R/I	
(13) No.4 engine P7 indicator	-	4-214	4E263	3CM station	77-12-11 R/I	77-12-01
(14) Landing gear weight switch relay	-	2-123	G307	Fwd. under-floor equip. racking	Chap.32	-
(15) No.1 engine 'go' light inhibit relay	-	19-123	1E465	Fwd. under-floor LH equip. racking	77-13-00 R/I	77-13-01
(16) No.2 engine 'go' light inhibit relay	-	19-123	2E465	Fwd. under-floor LH equip. racking	77-13-00 R/I	77-13-01
(17) No.3 engine 'go' light inhibit relay	-	20-123	3E465	Fwd. under-floor RH equip. racking	77-13-00 R/I	77-13-01
(18) No.4 engine 'go' light inhibit relay	-	20-123	4E465	Fwd. under-floor RH equip. racking	77-13-00 R/I	77-13-01
(19) No.1 engine caption light module	-	6-211	1E466	Centre instr. panel	77-13-00 R/I	77-13-01
(20) No.2 engine caption light module	-	6-211	2E466	Centre instr. panel	77-13-00 R/I	77-13-01
(21) No.3 engine caption light module	-	6-211	3E466	Centre instr. panel	77-13-00 R/I	77-13-01
(22) No.4 engine caption	-	6-211	4E466	Centre instr.	77-13-00 R/I	77-13-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
light module				panel		
(23) No.1 engine circuit diode	-	19-123	1E563	Fwd. under-floor LH equip. racking	-	77-13-01
(24) No.2 engine circuit diode	-	19-123	2E563	Fwd. under-floor LH equip. racking	-	77-13-01
(25) No.3 engine circuit diode	-	20-123	3E563	Fwd. under-floor RH equip. racking	-	77-13-01
(26) No.4 engine circuit diode	-	20-123	4E563	Fwd. under-floor RH equip. racking	-	77-13-01
(27) No.1 engine rev. thrust switch pack	-	9-211	1K332	Rear centre console	78-30-00 R/I	78-30-01
(28) No.2 engine rev. thrust switch pack	-	9-211	2K332	Rear centre console	78-30-00 R/I	78-30-01
(29) No.3 engine rev. thrust switch pack	-	9-211	3K332	Rear centre console	78-30-00 R/I	78-30-01
(30) No.4 engine rev. thrust switch pack	-	9-211	4K332	Rear centre console	78-30-00 R/I	78-30-01
(31) No.1 engine circuit breaker 28 V	-	5-213	1E121	Map ref.A3	24-50-00 R/I	78-30-05

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(32) No.2 engine circuit breaker 28 V	-	1-213	2E121	Map ref.B7	24-50-00 R/I	78-30-05
(33) No.3 engine circuit breaker 28 V	-	1-213	3E121	Map ref.B8	24-50-00 R/I	78-30-05
(34) No.4 engine circuit breaker 28 V	-	5-213	4E121	Map ref.A4	24-50-00 R/I	78-30-05
(35) Nos.1 and 4 engines wind down test switch	-	27-214	K1104	3CM station	76-11-** R/I	76-11-09
(36) Nos.2 and 3 engines wind down test switch	-	27-214	K1105	3CM station	76-11-** R/I	76-11-09
(37) No.1 engine AJ min. fail relay	-	19-123	1E560	Fwd. under-floor LH equip. racking	77-13-00 R/I	77-13-01
(38) No.2 engine AJ min. fail relay	-	19-123	2E560	Fwd. under-floor LH equip. racking	77-13-00 R/I	77-13-01
(39) No.3 engine AJ min. fail relay	-	20-123	3E560	Fwd. under-floor RH equip. racking	77-13-00 R/I	77-13-01
(40) No.4 engine AJ min. fail relay	-	20-123	4E560	Fwd. under-floor RH equip. racking	77-13-00 R/I	77-13-01
(41) No.1 engine AJ indicator	-	6-211	1E82	Centre instr. panel	78-30-** R/I	78-30-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(42) No.2 engine AJ indicator	-	6-211	2E82	Centre instr. panel	78-30-** R/I	78-30-01
(43) No.3 engine AJ indicator	-	6-211	3E82	Centre instr. panel	78-30-** R/I	78-30-01
(44) No.4 engine AJ indicator	-	6-211	4E82	Centre instr. panel	78-30-** R/I	78-30-01
(45) Circuit breaker 28 V	-	3-213	G293	Map ref.B8	24-50-00 R/I	-

Component Identification
Table 101

AIR INTAKE CONTROL - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. paras.3. and 4.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

This trouble shooting procedure is based on the 'Preliminary Test in Conjunction with Three Ground Hydraulic Test Rigs', followed by a test with all engines running.

The circuits for Nos.1, 2, 3 and 4 intakes are similar. Therefore, where equipment identical in each channel is involved, trouble shooting for No.1 intake is given by the first component reference (Table 101) and for intakes 2, 3 and 4, in that order, by the subsequent component references. E.g., in the term 'Board X (143), (148), (153) or (158)', 143 = intake 1, 148 = intake 2, and so on.

2. Preparation

A. Ensure that the associated circuit breakers are set (Ref. Table 101).

B. Make available electrical ground power as detailed in 24-41-00.

C. Make available three hydraulic ground rigs and pressurize the green, blue and yellow hydraulic systems as detailed in Chapter 29; check that the hydraulic operating pressures are normal and the hydraulic fluid levels are correct.

D. Ensure that the equipment racking air extraction system (Ref. 21-21-00) is operating throughout the trouble shooting procedure.

E. Ensure that the four intakes and the areas below the spill doors are clear of persons and equipment.

F. Post notices, warning of AICS operation, and position barriers to prevent persons from inadvertently entering the areas in the vicinity of the ramps and spill doors.

G. Check that the master warning system (MWS) (Ref. 33-15-00) and the associated audio warning system (AWS) (Ref. 31-23-00) are operating.

H. Ensure that the MWS red and amber INT captions are extinguished; extinguish them, if necessary, by pressing the face of each illuminated caption.

I. Test the filaments (Ref. 33-14-00) on the auto control panel (ACP), the air intake test panel (AITP) and the auto N1 reduce lamp on the N1 indicator (Ref. 77-11-00).

J. At the ACP, set -

(1) the four RAMP - SPILL MASTER switches to "AUTO",

(2) the four lane selector switches to "AUTO A", and

(3) the four hydraulic selector switches to "AUTO".

K. Ensure that the aircraft engines are not run during the 'Preliminary' trouble shooting procedures.

L. Air Intake Status Indicator Test Set (AISITS) TE6055

When the standard trouble shooting procedures fail to rectify a fault, more detailed trouble shooting can be carried out using the Air Intake Status Indicator Test Set (AISITS) TE6055. The AISITS is used as an integral part of the power plant. It can be used under static or dynamic conditions in the hangar, on engine ground runs or during test flights. It can also be used in conjunction with the Air Intake System Test Set (AISTS) TE6048.

The AISITS requires a 115V, single phase, 400 Hz supply. This is available at a connector next to the Air Intake Control Unit (AICU) racking in the aircraft. This connector type may differ between aircraft variants. A toggle switch on the test set front panel selects the power on and a neon lamp indicates the presence of the supply.

A connecting cable, provided with the test set, enables connection to the 'TEST' connector on the front of the AICU to be tested.

A digital voltmeter (DVM) included on the test set front panel provides a read-out of various parameters within the AICU. If this DVM is unserviceable, connectors are provided for the connection of a free-standing DVM.

'FAIL' monitors, status information and 'LANE IN USE' indications are displayed on the test set front panel. 'Control Data Highway' between Air Intake Sensor Units (AISU) and AICU and 'Processor Highway' are also indicated. A breakout patch is provided, enabling electrical access to all AICU front connector lines.

Knowledge of this information allows the operator to identify possible faulty areas of the Air Intake Control System (AICS). A useful way of doing this is by comparing the suspect intake with a known serviceable intake.

(1) Operating Procedure

<u>WARNING</u>: OBSERVE THE AIR INTAKE SAFETY PRECAUTIONS DETAILED IN THE MAINTENANCE MANUAL CHAPTER 71-00-00 SERVICING.
OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN THE MAINTENANCE MANUAL CHAPTERS 24-00-00 AND 29-00-00.

CAUTION: SWITCH OFF POWER SUPPLIES BEFORE MAKING OR BREAKING ANY CONNECTION FOR TEST PURPOSES.

(a) Installation of AISITS in the aircraft

(a1) At the Rear Equipment Racks, remove panels as required (L.H. side must be removed for access to the power supply socket).
(a2) Connect the AISITS TE6055 power cable to the power socket.
(a3) Connect the data loom to the front test connector of the AICU under test.
(a4) Switch on the TE6055 and set the AICU circuit breaker.

(2) Failure Monitor Lamps

With the test set connected to the required AICU the lamps can be observed for indication of system failures. Lamps A to Z and E1 to E6 are illuminated when the appropriate input lines are grounded by the AICU. Failures are indicated when the lights are illuminated.

The lights are extinguished when either an input line is open circuit, or a voltage of between 2.5V and 5V d.c. is on the input lines.

The LANE IN USE lamp operates in the opposite sense. It is extinguished by 0V signal from the AICU.

The lamp input signals are buffered by integrated circuits on card 8.

The monitors are combined within each AICU to produce logic signals which control six relays. These relays then control the switching logic within the Interface Unit. The combination logic is defined in table 106.

In addition, the monitors are combined to form 10 logic signals which are transmitted along the test highway to the Air Intake Test Unit (AITU). At the AITU these signals are used to determine which captions are illuminated on the Air Intake Test Panel (AITP) in the event of a failure. The combination logic is defined in table 107.

Further information on monitors and failure interpretation is given in Tables 108 to 111.

Details of AICU relay signals and failure monitoring relays can be found on figs. 1 & 2.

(a) Monitors K and Q (servo-valves or associated plugs and wiring) are always failed when the lane is not in use. This may also result in monitors J and P being failed, depending on conditions.
Determination of a real fault in these four monitors is difficult.

If this area is suspect, the AISITS TE6055 should be observed while the lane is selected on the Air Intake Management Panel (AIMP). Monitoring is inhibited for 135 msecs during the start period. During this time the AICU will remain in use even if one or more of monitors J, K, P and Q are failed. While the AICU is in use the failed monitor(s) light-emitting diode (LED) will be illuminated and can clearly be seen to be on before the others. The LANE IN USE LED will also indicate the instant of selection.

(b) Monitors M and S have monostables associated with them to ensure the presence of a failed state long enough for recognition by the AITU. However, when an AICU is selected, these monitors fail transiently and activate the monostables. Thus, whenever a lane is selected, the AITU diagnoses RA and SA L.R.U. faults. This renders the AITP captions of little use. By using the AISITS TE6055 and watching the M and S monitors and L.R.U. LEDs, an actuator fault can be diagnosed because either M or S may remain lit until the lane/hydraulics is out of use.

(c) Monitor U and the AITP PV LRU indicates a discrepancy between the control and monitor PV sensors, but does not indicate the faulty unit. The monitor fails for a difference of 0.37 ± 0.1V between control and monitor outputs. The voltage output from the monitor PV sensor can be determined using the AISITS TE6055 (It should be 7.74V for 14.7 psia). By comparison of the AICUs in the nacelle involved, the monitor PV sensor can be confirmed as being faulty or not.

If the monitor PV sensor is found to be serviceable then the control PV sensor is likely to be faulty.

The control PV sensor output can only be checked when the AICU processor conditions are supersonic. This requires the use of the AISTS TE6048. Therefore, the above procedure may be preferred although care must be taken because one sensor may indicate slightly high and the other slightly low. This increases the difference between the outputs while both sensors are, in fact, serviceable.

(3) Analogue Signal Monitoring

Analogue signals from the AICU front connector can be monitored using the test sets' digital voltmeter. When the DVM input terminals are linked to the sockets marked 'INT DVM', signals can be switched to the DVM by the selectors A and B in accordance with tables 112 and 113. The scaling and locations of these signals is given in table 114 (for Processor Program Issue 314).

NOTES:

(a) Where NA is written under DVM, FTC PIN, or SELECTOR headings, the value of the parameter can only be determined in a digital form.

(b) Where NA is written under H/W INST or H/W BITS headings, the parameter is only available in analogue form.

(c) The digital form of PV, i.e. PV control, is only available when the processor is in the supersonic mode, i.e. greater than mach (M) 1.3.

(d) The PFC automatic word is only available at less than M 1.3.

(4) Use of the Z Highway Display

In order to use the display, a current copy of the 'AICU Processor Program' (Issue 314) is necessary to determine the instruction numbers for various parameters.

To obtain the value of a parameter set the Main Instruction No. and the Sub-Instruction No. (or Data Point) on the thumbwheel switches. Put the toggle switch to SET.

Press and immediately release the SET button and the Main Instruction No. required should appear in the Instruction No. display. The data appears in decimal form. If the WARNING lamp illuminates, the required Instruction No. is not being carried out by the processor and the data is not valid.

(a) Watchdog Timer Output from the Processor

The Watchdog Timer output occurs once per cycle at Instruction 509 data point 1 (INST. 509-01). If the output is failed then this instruction is omitted by the processor.

Fail is given by one of the following:-

(a1) an incorrect path through the program
(a2) dummy data not checking (i.e. T5 not equal to zero at INST. 493-02).
(a3) a processor malfunction causing η ve to be calculated incorrectly (INST. 321-02 is not zero).

Processor Fail (A fail) is produced by applying the Watchdog Timer pulse and the processor Fail output to an OR gate.

(b) Fail Output from the Processor

Fail output is given at INST.049-01 for Digital Data failed and at INST.376-01 for other failures. Under normal conditions (i.e. no failures) neither of these instructions are carried out by the program.

(c) Digital Data Fail

A fail is output if any of the following conditions is satisfied for three or more consecutive cycles:-

c1) INST.031-02 — P_S1 and P_S2 differ by more than 15 counts (i.e. T5 is equal to or greater than 16)
c2) INST.041-02 — P_T1 and P_T2 differ by more than 31 counts (i.e. T5 is equal to or greater than 32).

(d) Other Fails

A fail is output if any of the following conditions is satisfied:-

d1)	INST.094-02	is zero or negative (i.e. the denominator in the division sub-routine is equal to or less than 0)
d2)	INST.174-02	XRA and XRB analogue inputs differ by more than 96 counts
d3)	INST.179-02	XDA and XDB analogue inputs differ by more than 96 counts
d4)	INST.204-02	N1 control and monitors inputs differ by more than 64 counts
d5)	INST.252-03	N1 is not between 196 and 488 counts during PFC (PFC only)
d6)	INST.296-02	PV control and monitor inputs differ by more than 64 counts (supersonic only).

(e) 'A' monitor fail diagnosis example.

An 'A' monitor failure is produced when the Watchdog Timer pulse and the processor Fail output are applied to an OR gate.

Set INST.049-01. If the warning light is extinguished digital data failure is indicated, i.e. P_S1 differs from P_S2 by the value indicated at INST.031-02, or P_T1 differs from P_T2 by the value indicated at INST.041-02. Such a fault indicates the loss of control highway data from the sensor unit or the AICU receiver card.

If the warning light is not extinguished, set INST.376-01. If the warning light is now extinguished the cause of failure can be located at one of the following points:-

(e1)	INST 174-02	XRA and XRB difference (should not exceed 96 counts), either an AICU or resolver fault
(e2)	INST.179-02	XDA and XDB difference (should not exceed 96 counts), either on AICU or resolver fault
(e3)	INST.204-02	N1A and N1B difference (should not exceed 64 counts), AICU fault.

(e4)	INST.252-02	N1 during PFC (should be between 196 and 488 counts), AICU fault
(e5)	INST.296-02	PVA and PVB difference (should not exceed 64 counts), AICU fault
(e6)	INST.094-02	Denominator in Division sub-routine (should not be zero or less), AICU fault.

The binary display is particularly useful for observing the Status Word in the processor where individual bits indicate the state of various inputs to the processor. These inputs can be AICU position idents, Pre-Flight Check selected, Lane in Use, etc.

Other monitors found to be in the failed state can be investigated by comparing the value displayed (e.g. the control value) with its monitor value, i.e. XRA and XRB on INST. 173-01 or - 03 should be within 96 counts of each other and the value quoted in table 114.

M. Air Intake System Test Set (AISTS) TE6048

Trouble shooting the AICS can be facilitated using the Air Intake System Test Set (AISTS) TE6048 in conjunction with the Air Intake Status Indicator Test Set (AISITS) TE6055. The AISTS is used for the functional test of the AICS (Ref. MM Ch. 71-61-00). It is connected in place of the Air Intake Test Unit (AITU) using the connecting cables provided.

The AISTS provides simulation of incidence and sideslip angles, static pressure and total pressure data. This enables the operator to simulate any flight condition required during system testing (not auto-test).

The operation of the AICUs can be visually monitored from the lamps displayed on the AISTS front panel.

(1) Operating Procedure

WARNING: OBSERVE THE AIR INTAKE SAFETY PRECAUTIONS DETAILED IN M.M 71-00-00.
OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN M.M. 24-00-00 AND 29-00-00.

CAUTION: SWITCH OFF THE POWER SUPPLIES BEFORE MAKING OR BREAKING ANY CONNECTION FOR TEST PURPOSES.

(a) Preparation

Carry-Out preparation as per paras. A to K.

(b) Installation of test set

b1) Trip the AITU circuit breakers K1755 and K1754 (Ref. M.M. Ch.71-61-18)
b2) Connect the AISTS cable loom between K1753 DPX and the test set.
b3) Reset the AITU circuit breakers tripped at b1)
b4) Switch on the test set 115V switch and ensure that the 115V neon is lit.
b5) Press 'LAMP TEST' button and ensure all lamps are lit.

(c) Setting of Test Conditions

c1) Ensure all AICS circuit breakers are reset.
c2) Ensure hydraulic supplies are available.
c3) Make available a void pressure supply if supersonic scheduling is to be checked.
c4) Set Auto/Manual AIMP switches to MANUAL until flight conditions are set up.
c5) Set up flight conditions using the thumb-wheel switches.
c6) With the required data set on the thumb-wheel switches, set the GROUND/FLIGHT switches and the Test Panel Master Switch at the 3CM station to ON.

The data on the thumbwheel switches will then be accepted by the aircraft sensor units and transmitted to the control units.

During subsequent alterations to the thumb wheel switch settings the DATA INTERRUPT button must be depressed and illuminated. This prevents unnecessary lane failures due to steps in switch outputs.

If the MANAGEMENT PANEL lane selectors are at Auto 'A' and the hydraulic selectors are at AUTO, then lane and hydraulic system changes can be reset by pressing the RESET buttons on the test set.

(d) Test Condition Information

When the test set is used for system trouble shooting, the digital values of pressure and incidence to be set on the thumb-wheel switches are listed in Table 115 (also in M.M. Ch. 71-61-00).

The test set can also be used to simulate certain conditions where system failures occur during the automatic pre-flight check (PFC) or during flight. For these cases the digital values of pressure and incidence must be ascertained from either the PFC program, Table 115, or actual flight data (possibly from Aircraft Integrated Data System (AIDS)).

The thumbwheel inputs are linear between 0 and 4096 bits and range as follows:-

Alpha vane (α), from +35 deg. to -35 deg.
Beta vane (β), from -35 deg. to +35 deg.
P_S and P_T, from 0 psi to 19 psi.

The maximum valid thumbwheel setting for any parameter is 4095.

For flight simulation Beta can be set to 2048 bits. The PFC word must be set to 3808 or 3680. This is a 'clear' word which enables normal operation of the monitors.

The PFC word enables the AITU to command the AICU to fail various internal monitors during the automatic test. This word is not read into the processor during supersonic operations. Before supersonic conditions are set up, subsonic or transonic conditions must be transmitted to the AISUs together with the 'clear' word. Details of the PFC word are given in Tables 116 and 117.

Values of N1 can be set using the throttle control system. If, however, an external source of N1 is not available, the 'N1 FAIL' condition can be removed using the internal 35% N1 oscillator. This is achieved by setting the PFC word to 3680. If the Mach number is between 0.7 and 1.3 this condition will lower the ramp and spill doors on the N1 schedule. At high Mach numbers the

difference between Sensor Unit 2 (SU2) settings and the other sensor unit settings becomes critical. Cross-monitoring failures may occur if the relationships shown are not maintained.

Values for PV are given in Table 115. These values are not set on the AISTS TE6048. They must be provided by a pneumatic generator capable of producing 200 mb absolute pressure or 24 ins/Hg vacuum (e.g. a Pressure Generator - Air Data System Type 12-3 connected by four air lines to the PV sensors in the intake under test).

While fine control of PV is required, precise knowledge of the pressure is less important.

With PV set to the required value and the intakes selected to AUTO, the surfaces may raise or lower. To drive the surfaces, increased pressure lowers the surfaces while reduced pressure raises them. The values given should result in stable conditions with the spill door shut and the ramps at approximately mid-travel. If one sensor is isolated and the pressure changed, a lane fail and change-over should occur for a change in pressure of between 35 and 62 mbars.

(e) Monitoring

MANAGEMENT PANEL FAILURE captions can be monitored at the test set together with the test highway status of the AICU. This information is produced within the AICU by combining the 18 AICU internal monitors.

The TEST HIGHWAY lamps come on when the conditions signified by the lamp titles are recognised by the AICU.

The Comparator Check (COMP CHECK) lamps come on when a comparator check PFC instruction is set on the thumbwheel switches.

FAILURE ANALYSIS lamps come on when a failure is recognised by the AICU.

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Further monitoring of the AICS to verify receipt of the correct data by the AICU can be achieved using the Air Intake Status Indicator Test Set (AISITS) TE6055 (see PARA L).

3. Trouble Shooting - Preliminary Test in Conjunction with Three Ground Hydraulic Test Rigs

```
  A.*****************************************     NOTE: Before
R   *Prepare to trouble shoot (Ref. para.2.).*           renewal of
    *At the ACP check that the four N1 SIG   *           components
    *and four lane 'A' LANE failure captions *           (*) check the
    *and the four lane 'B' lane-in-use lamps *           associated
    *are illuminated and that all other      *           wiring for
    *failure captions are extinguished.  IF -*           continuity.
    ******************************************
           |         |
           |         |                  -------------------------------
           OK        NOT OK ----------|1. An intake N1 SIG and lane 'A'|
           |                          |   LANE failure captions and the|
           |                          |   lane B lane-in-use lamp      |
           |                          |   remain extinguished with the |
           |                          |   lane A lane-in-use lamp illu-|
           |                          |   minated - renew Air Intake   |
           |                          |   Control Unit (41),(43),(45)  |
           |                          |   or (47); if fault remains,   |
           |                          |   renew Board X (143),(148),   |
           |                          |   (153) or (158).              |
           |                          |2. An intake N1 SIG failure cap-|
           |                          |   tion remains extinguished    |
           |                          |   (lane 'A' LANE failure capt- |
           |                          |   tion and lane B lane-in-use  |
           |                          |   lamp illuminated) - set the  |
           |                          |   lane selector switch to "B"; |
           |                          |   if fault remains, renew Auto |
           |                          |   Control Panel (67); if fault |
           |                          |   cleared, renew Air Intake    |
           |                          |   Control Unit (41),(34),(45)  |
           |                          |   or (47); if fault still pres-|
           |                          |   ent, renew Board X (143),    |
           |                          |   (148),(153) or (158); reset  |
           |                          |   lane selector switch to      |
           |                          |   "AUTO A".                    |
           |                          |3. An intake N1 SIG and lane 'A'|
           |                          |   LANE failure captions remain |
           |                          |   extinguished (lane B lane-in-|
           |                          |   use lamp illuminated) -      |
           |                          |   - Chart 101.                 |
```

	4. An intake lane 'A' LANE caption remains extinguished (N1 SIG failure caption and lane B lane-in-use lamp illuminated) - renew Board X (143), (148), (153) or (158); if fault remains, renew Auto Control Panel (67).
OK	5. The 'alpha' failure caption is illuminated (all other indications correct) - Chart 102.
	6. An intake INT failure caption is illuminated with lane B in use (N1 SIG and lane 'A' LANE failure captions and the lane B lane-in-use lamp illuminated) - renew Auto Control Panel (67).
	7. An intake INT failure caption is illuminated with lane B LANE failure caption and Lane B lane-in-use lamp extinguished (N1 SIG and lane 'A' LANE failure captions illuminated) - *renew Auto Control Panel (67); if fault remains renew board X (143) (148), (153) or (158).
	8. An intake INT failure caption is illuminated and the lane B lane-in-use lamp is extinguished (N1 SIG and lane 'A' LANE failure captions illuminated) - Chart 103.
	9. An intake INT and lane 'B' LANE failure captions are illuminated and the lane B lane-in-use lamp is extinguished (N1 SIG and lane 'A' LANE failure captions illuminated) - renew Board X (145), (150), (155) or (160); if fault remains, renew Air Intake Control Unit (42), (44), (46) or (48).

10. Lane B lane-in-use lamp remains out (N1 SIG and lane A failure captions illuminated - INT and lane 'B' LANE failure captions extinguished) - renew Auto Control Panel (67).
11. An intake lane 'B' LANE failure caption is illuminated (lane 'A' LANE and N1 SIG failure captions and lane B lane-in-use lamp illuminated) - Chart 104.
12. An intake HYD failure caption is illuminated (N1 SIG and lane 'A' LANE failure captions and the lane B lane-in-use lamp illuminated) - Chart 105.
13. The HYD failure captions for intakes 1 and 2 (3 and 4) are illuminated (N1 SIG and lane 'A' LANE failure captions and the lane B lane-in-use lamp illuminated) - Chart 106.
14. The HYD, INT and LANE B failure captions for intakes 1 and 2 (3 and 4) are illuminated and the lane B lane-in-use lamp are extinguished (N1 SIG and lane A lane-in-use lamp illuminated) - refer to Trouble Shooting, 71-00-41 and 71-00-42.
15. An intake HYD, INT and lane 'B' LANE failure captions are illuminated and the lane B lane-in-use lamp is extinguished (N1 SIG and lane 'A' LANE failure captions illuminated) - refer to Trouble Shooting, 71-00-41 and 71-00-42.

B. *Set the four hydraulic selector switches to "YELLOW". Check that the HYD failure caption remains extinguished. IF -*

- OK
- NOT OK → 1. HYD failure caption illuminated (N1 SIG, LANE A and INT failure captions illuminated, both lane-in-use lamps extinguished) - Chart 107.

C. *Set the four RAMP - SPILL MASTER switches to "MAN", in turn. After each setting has been made check that the appropriate intake INT failure and MWS red INT failure captions are illuminated, accompanied by the AWS single-stroke gong, and that all other failure captions and the lane-in-use lamps for the intake selected are extinguished. IF -*

- OK
- NOT OK →
  1. An intake INT failure caption remains extinguished - renew Auto Control Panel (67).
  2. An intake N1 SIG and/or lane 'A' LANE failure caption remains illuminated - renew Auto Control Panel (67).
  3. The MWS and AWS are not activated - check for earth potential at pin 26 of MWS test socket W272-A (Ref. 33-15-00), (pin 28, W273-A), (pin 27, W274-A) or (pin 27, W275-A). If present, refer to MWS Trouble Shooting (33-15-00); if not present, *renew Auto Control Panel (67).

```
         |
D.******************************************
  *Using the RAMP RAISE - LOWER inching    *
  *switches, lower each ramp, in turn,     *
  *approximately 20 per cent and then      *
  *return it to the fully up position      *
  *(0 per cent).  If -                     *
  ******************************************
         |              |
         |              |      ---------------------------------
        OK           NOT OK------|1. A ramp does not lower -       |
         |                     |   Chart 108.                  |
         |                     |2. A ramp does not rise - Chart |
         |                     |   109.                        |
         |                     |3. Position indication is      |
         |                     |   incorrect - refer to        |
         |                     |   71-00-41, Trouble Shooting. |
         |                     ---------------------------------
         |
E.******************************************
  *Using the SPILL CLOSE - OPEN inching    *
  *switches, open each spill door, in turn,*
  *approximately 20 per cent, wait for 3 s *
  *and check that the spill door does not  *
  *move and then return it to the fully    *
  *closed position (0 per cent). If -      *
  ******************************************
         |              |
         |              |      ---------------------------------
        OK           NOT OK------|1. A spill door does not open - |
         |                     |   Chart 110.                  |
         |                     |2. A spill door does not shut - |
         |                     |   Chart 111.                  |
         |                     |3. Position indication is      |
         |                     |   incorrect - refer to        |
         |                     |   71-00-42, Trouble Shooting. |
         |                     ---------------------------------
         |
F.******************************************
  *Set the four hydraulic select switches  *
  *to "AUTO" and repeat operations D. and  *
  *E.  If -                                *
  ******************************************
         |              |
```

```
      |                 |
      OK          NOT OK------|1. Ramp does not lower - Chart |
      |                       |   112.                        |
      |                       |2. Ramp does not rise - Chart  |
      |                       |   113.                        |
      |                       |3. Spill door does not open -  |
      |                       |   Chart 114.                  |
      |                       |4. Spill door does not shut -  |
      |                       |   Chart 115.                  |
      |
G.*******************************************
  *Set the four lane selector switches to  *
  *"A" and the four RAMP - SPILL MASTER    *
  *switches to "AUTO", in turn.  After each*
  *setting has been made check that the    *
  *appropriate INT, LANE ('A' and 'B') and *
  *HYD failure captions, lane B lane-in-use*
  *lamp and the N1 reduce lamp (on the N1  *
  *indicator) are extinguished and that the*
  *lane A lane-in-use lamp and the N1 SIG  *
  *failure captions are illuminated,       *
  *accompanied by the amber MWS and AWS    *
  *indications; press-to-cancel the MWS    *
  *amber INT captions.  IF -               *
  *******************************************
      |          |
      OK      NOT OK-----------|1. The MWS amber warnings are  |
      |                        |   not given - press-to-test the|
      |                        |   N1 SIG failure caption.  If |
      |                        |   warning is given, *renew Auto|
      |                        |   Control Panel (67);  if     |
      |                        |   warning is not given, check |
      |                        |   for earth potential at pin 43|
      |                        |   of MWS socket (Ref. 33-15-00)|
      |                        |   W272A, (pin 38, W273-A), (pin|
      |                        |   42, W274-A) or (pin 41, W275-|
      |                        |   A).  If present, refer to MWS|
      |                        |   Trouble Shooting (Ref.      |
      |                        |   33-15-00);  if not present, |
      |                        |   *renew Auto Control Panel   |
      |                        |   (67).                       |
      |                        |2. INT failure caption illumin-|
      |                        |   ated (N1 SIG failure caption|
      |                        |   illuminated, both lane-in-use|
      |                        |   lamps and both LANE failure |
      |                        |   captions extinguished) -    |
      |                        |   Chart 116.                  |
      |
```

```
        |
H.*******************************************
  *Set the four hydraulic selector switches*
  *to "YELLOW", in turn.  After each selec-*
  *tion has been made check that the assoc-*
  *iated LANE 'A' lane failure caption     *
  *remains extinguished and that lane A is *
  *in use.  IF -                           *
  *****************************************
        |              |
        |              |          ---------------------------------
        OK             NOT OK-----|LANE 'A' lane failure caption  |
        |                         |illuminated - check for d.c.   |
        |                         |supply at pin c of TEST socket |
        |                         |(1A),(2A),(3A),(4A), on        |
        |                         |Interface Unit (179),(180),(181)|
        |                         |or (182). If present, renew    |
        |                         |board Y (144),(145),(154) or   |
        |                         |(159) in lane A; if not present,|
        |                         |renew Board Y (146),(151),(156)|
        |                         |or (161), in lane B.           |
        |                         ---------------------------------
        |
I.*******************************************
  *Check that the pointer on each pressure *
  *ratio error indicator is aligned with   *
  *the graduation at the twelve o'clock    *
  *position.  Press-to-test the INT failure*
  *caption on the ACP.  Check that the INT *
  *caption is illuminated and the MWS and  *
  *AWS are activated.  Set the four RAMP - *
  *SPILL MASTER switches to "MAN"; press-  *
  *to-cancel the MWS red INT captions.     *
  *IF -                                    *
  *****************************************
        |              |
        |              |          ---------------------------------
        OK            NOT OK------|1.   A pressure ratio error indi-|
        |                         |     cator is not indicating -  |
        |                         |     Chart 120.                 |
        |                         |2.   A pressure ratio error     |
        |                         |     indicator pointer is not   |
        |                         |     aligned with the graduation|
        |                         |     at the twelve o'clock      |
        |                         |     position - remove the      |
        |                         |     Pressure Ratio Error Panel |
        |                         |     (191), and adjust the      |
        |                         |     associated potentiometer   |
        |                         |     (187),(188),(189) or (190).|
```

3. The INT caption is not illuminated and/or the MWS and AWS are not activated - renew Auto Control Panel (67).

J. Press-to-test N1 SIG, LANE and HYD failure captions on the ACP, in turn. Check that each caption is illuminated and the associated MWS and AWS are activated. IF -

OK

NOT OK

1. The LANE or HYD captions are not illuminated - *renew Auto Control Panel (67).
2. The MWS/AWS are not activated when the LANE caption is pressed - check for earth potential at pin 47 of MWS test socket (Ref. 33-15-00) W272-A, (pin 42, W273-A), (pin 46, W274-A) or (pin 45, W275-A). If present, refer to MWS Trouble Shooting (Ref. 33-15-00); if not present, *renew Auto Control Panel (67).
3. The MWS/AWS are not activated when the HYD caption is pressed - check for earth potential at pin 46 of MWS test socket (Ref. 33-15-00) W272-A, (pin 41, W273-A), (pin 45, W274-A) or (pin 44, W275-A). If present, refer to MWS Trouble Shooting (Ref. 33-15-00); if not present, *renew Auto Control Panel (67).

K. Press-to-test the 'alpha' failure caption on the ACP. Check that the caption is illuminated and the four MWS amber INT captions and the AWS are activated. IF -

OK

NOT OK

1. The 'alpha' failure caption is not illuminated - renew Auto Control Panel (67).
2. The MWS/AWS are not activated - check for earth potential at pin 44 of MWS test connector (Ref. 33-15-00) W272-A, (pin 39, W273-A), (pin 43, W274-A) or (pin 42, W275-A). If present, refer to MWS Trouble Shooting (Ref. 33=15=00); if not present, *renew Auto Control Panel (67).

L. Set the four lane select switches to "AUTO A" and set the intake test ON - OFF switch, on the AITP, to "ON". Check that the ON caption and all four red MWS captions are illuminated. IF -

OK

NOT OK

The ON caption is not illuminated and the MWS/AWS are not activated - Chart 117.

After SB 71-001   For A/C 001-003,

```
L.*******************************************
  *At the ram air turbine (RAT) test panel *
  *(Ref. 29-24-00) set the AICS GROUND -   *
  *FLIGHT switch for No.1 intake to        *
  *"GROUND" and check that the MWS red INT *
  *caption for each intake is illuminated, *
  *accompanied by a single-stroke gong.    *
  *Return the switch to the "FLIGHT"       *
  *position and check that the MWS red INT *
  *captions are extinguished.              *
  *                                        *
  *Repeat the above operation as applied   *
  *to the AICS GROUND - FLIGHT switches for*
  *Nos.2,3 and 4 intakes, in turn.         *
  *                                        *
  *At the AITP set the intake test ON - OFF*
  *switch to "ON".  Check that the ON      *
  *caption and MWS red INT captions are    *
  *illuminated.  Return the switch to the  *
  *"OFF" position and check that the ON    *
  *caption and MWS red INT captions are    *
  *extinguished.                           *
  *                                        *
  *Set the four AICS GROUND - FLIGHT       *
  *switches to "GROUND" and the AITP intake*
  *test ON - OFF switch to "ON"; press to  *
  *cancel the MWS red INT captions.        *
  *                                        *
  *IF -                                    *
  ******************************************
```

```
       |       |
       |       |          ----------------------------------
       |       |         |1. When No.1 AICS GROUND - FLIGHT |
       OK     NOT OK-----|   switch is set to GROUND the MWS|
       |                 |   is not activated - set No.2    |
       |                 |   AICS GROUND - FLIGHT switch to |
       |                 |   "GROUND".  If the MWS is       |
       |                 |   activated,*renew  Ground Flight|
       |                 |   Switch (209); if MWS is not    |
       |                 |   activated - Chart 123.         |
       |                 |2. When No.2,3 or 4 AICS GROUND - |
       |                 |   FLIGHT switch is set to GROUND |
       |                 |   the MWS is not activated -     |
       |                 |   *renew Ground - Flight Switch  |
       |                 |   (210), (211) or (212).         |
       |                 |3. When the intake test switch is |
       |                 |   set to ON, the ON captions and |
       |                 |   the MWS red INT captions are   |
       |                 |   not illuminated - Chart 117.   |
       |                 |4. When the intake test ON - OFF  |
       |                 |   switch is set to ON, the ON    |
       |                 |   caption remains extinguished   |
       |                 |   with the MWS activated - renew |
       |                 |   AITP (50).                     |
       |                 |5. When the intake test ON - OFF  |
       |                 |   switch is set to ON, the ON    |
       |                 |   caption is illuminated and the |
       |                 |   MWS is not activated - *renew  |
       |                 |   AITP (50).                     |
       |                  ----------------------------------
       |
M.*******************************************
  *Check that the HOLD caption, on the     *
  *AITP, is illuminated after a delay of   *
  *approximately 7 s.  IF -                *
  ******************************************
        |              |
```

```
        |                |            -------------------------------
       OK             NOT OK-----|The HOLD caption is not        |
        |                        |illuminated - Chart 118.       |
        |                         -------------------------------
N.*****************************************
  *WARNING:  RAMPS AND SPILL DOORS WILL    *
  *          MOVE DURING THE TESTS.        *
  *Set the RAMP - SPILL MASTER switches    *
  *to "AUTO" and then start the test       *
  *program by setting the CONTINUE - OFF   *
  *switch to "CONTINUE".  Check that the   *
  *HOLD caption is extinguished and that   *
  *after approximately 5 min the N1 REQD   *
  *caption is illuminated. IF -            *
  *****************************************
        |                |
        |                |            -------------------------------
       OK             NOT OK------|The HOLD caption and binary     |
        |                         |pattern address caption are     |
        |                         |illuminated and all equipment   |
        |                         |failure captions remain exting- |
        |                         |uished -  add the binary pattern|
        |                         |address to obtain the test      |
        |                         |'Pattern' number (Ref.          |
        |                         |Table 103) and consult both     |
        |                         |Tables 103 and 105 to determine |
        |                         |the test 'Sequence' number at   |
        |                         |which the failure occurred.  In |
        |                         |addition, reference to Table 102|
        |                         |should be made to determine the |
        |                         |expected ACP display for a given|
        |                         |test Pattern number. Having     |
        |                         |determined the possible cause of|
        |                         |failure, carry out the appro-   |
        |                         |priate remedial action.         |
        |                         |If the HOLD caption, binary     |
        |                         |pattern address and an equipment|
        |                         |failure caption are illuminated,|
        |                         |carry out the rectification     |
        |                         |action detailed below as applied|
        |                         |to the appropriate illuminated  |
        |                         |equipment failure caption.      |
        |                         |If the above actions fail to    |
        |                         |clear the fault, continue       |
        |                         |Trouble Shooting on Chart 122.  |
```

- 'alpha' caption illuminated - Chart 102.
- SU1 caption illuminated - check for 115 V a.c. at pin 3 of rack connector 1K2801-A If present, renew Sensor Unit (37); if not present, *renew CB (6).
- SU2 caption illuminated - check for 115 V at pin 3 of rack connector 2K2801-A. If present, renew Sensor Unit (38); if not present, *renew CB (25).
- SU3 caption illuminated - check for 115 V a.c. at pin 3 of rack connector 3K2801-A If present, renew Sensor Unit (39); if not present, *renew CB (14).
- SU4 caption illuminated - check for 115 V a.c. at pin 3 of rack connector 4K2801-A If present, renew Sensor Unit (40); if not present, *renew CB (32).
- RP1 caption illuminated - Chart 119.
- RP2 caption illuminated - Chart 119.
- RP3 caption illuminated - Chart 119.
- RP4 caption illuminated - Chart 119.
- PV1 caption illuminated - *renew lane A Control and Monitor Absolute Pressure Sensors (51) and (52).
- PV2 caption illuminated - *renew lane B Control and Monitor Absolute Pressure Sensors (53) and (54).
- PV3 caption illuminated - *renew lane A Control and Monitor Absolute Pressure Sensors (55) and (56).

- PV4 caption illuminated - *renew lane B Control and Monitor Absolute Pressure Sensors (57) and (58).
- PV5 caption illuminated - *renew lane A Control and Monitor Absolute Pressure Sensors (59) and (60).
- PV6 caption illuminated - *renew lane B Control and Monitor Absolute Pressure Sensors (61) and (62).
- PV7 caption illuminated - *renew lane A Control and Monitor Absolute Pressure Sensors (63) and (64).
- PV8 caption illuminated - *renew lane B Control and Monitor Absolute Pressure Sensors (65) and (66).
- SP1 caption illuminated - *renew No.1 Intake Spill Door Position Resolver Chassis Assembly (93).
- SP2 caption illuminated - *renew No.2 Intake Spill Door Position Resolver Chassis Assembly (94).
- SP3 caption illuminated - *renew No.3 Intake Spill Door Position Resolver Chassis Assembly (95).
- SP4 caption illuminated - *renew No.4 Intake Spill Door Position Resolver Chassis Assembly (96).
- RA1 caption illuminated - refer to ramp actuator Trouble Shooting (Ref. 71-00-41).
- RA2 caption illuminated - refer to ramp actuator Trouble Shooting (Ref. 71-00-41).

- RA3 caption illuminated - refer to ramp actuator Trouble Shooting (Ref. 71-00-41).
- RA4 caption illuminated - refer to ramp actuator Trouble Shooting (Ref. 71-00-41).
- SA1 caption illuminated - refer to spill door actuator Trouble Shooting (71-00-42).
- SA2 caption illuminated - refer to spill door actuator Trouble Shooting (Ref. 71-00-42).
- SA3 caption illuminated - refer to spill door actuator Trouble Shooting (Ref. 71-00-42).
- SA4 caption illuminated - refer to spill door actuator Trouble Shooting (Ref. 71-00-42).
- CU1 caption illuminated - renew No.1 AICU (41).
- CU2 caption illuminated - renew No.2 AICU (42).
- CU3 caption illuminated - renew No.3 AICU (43).
- CU4 caption illuminated - renew No.4 AICU (44).
- CU5 caption illuminated - renew No.5 AICU (45).
- CU6 caption illuminated - renew No.6 AICU (46).
- CU7 caption illuminated - renew No.7 AICU (47).
- CU8 caption illuminated - renew No.8 (48).

```
        |
O.*******************************************
  *Set the intake test ON - OFF switch to  *
  *"OFF".  Check that the ON caption and   *
  *red MWS captions are extinguished. IF - *
  *******************************************
        |              |
        |              |            --------------------------------
        OK             NOT OK-----|The ON caption remains          |
        |                         |illuminated - renew AITP (50).  |
        |                           --------------------------------
        |
P.*******************************************
  *Set the RAMP - SPILL MASTER switches to *
  *"MAN"; press-to-cancel the MWS red INT  *
  *captions.  Set the RESET - OFF switch on*
  *the AITP to "RESET" and release it;     *
  * check that all captions except the N1  *
  *caption on the AITP are extinguished.   *
  *IF -                                    *
  *******************************************
        |              |
        |              |            --------------------------------
        OK             NOT OK-----|Any caption remains illuminated |
        |                         | - renew AITP (50).             |
        |                           --------------------------------
        |
Q.*******************************************
  *Set the four lane selector switches to  *
  *"LANE B". Check that the pointers on all*
  *four pressure ratio error indicators are*
  *at the twelve o'clock position.  IF -   *
  *******************************************
        |              |
        |              |            --------------------------------
        OK             NOT OK-----|1. Indicator not indicating -   |
        |                         |   Chart 121.                   |
        |                           ================================
        |
R.*******************************************
  *Switch off and disconnect electrical    *
  *ground power as detailed in 24-41-00.   *
  *Disconnect and remove the ground        *
  *hydraulic supply rigs (Ref. Chap.29).   *
  *Remove all barriers and warning         *
  *placards.                               *
  *******************************************
```

4. Trouble Shooting - Test All Engines Running at Idle Power

```
    A.*****************************************
      *Ensure that a Trouble Shooting -       *
      *Preliminary Test (Ref. para.3.) has been*
R     *carried out.  At the electrical        *
R     *generation control panel, set the      *
R     *generator control switch to "OFF" for  *
R     *all four engines.  Start and run all   *
R     *four engines as detailed in 71-00-00.  *
R     *Check that the main and standby        *
R     *hydraulic supplies are normal.  IF-    *
       ****************************************
            |              |
            |              |            --------------------------------
            OK             NOT OK-----|The hydraulic supplies are not  |
            |                         |normal - refer to Trouble       |
            |                         |Shooting, Chapter 29.           |
            |                          --------------------------------
            |
    B.*****************************************
      *Set the RAMP - SPILL MASTER switches to *
      *"AUTO", the lane select switches to "B" *
      *and then to "AUTO A", and the hydraulic *
      *select switches to "YELLOW" and then to *
      *"AUTO".  Check that all failure captions*
      *are extinguished and the lane A lane-in-*
      *use lamps are lit.  IF -               *
      *****************************************
            |              |
            |              |            --------------------------------
            OK             NOT OK-----|Any combination of failure      |
            |                         |captions illuminated without a  |
            |                         |N1 caption illuminated - shut   |
            |                         |down engines (Ref. 71-00-00) and|
            |                         |repeat Trouble Shooting -       |
            |                         |Preliminary Test (Ref. para.3.).|
            |                          --------------------------------
            |
    C.*****************************************
      *At the AITP set the intake test ON - OFF*
      *switch to "ON", wait approximately 7 s  *
      *and when the HOLD caption is illuminated*
      *start the test program by setting the   *
      *CONTINUE - OFF switch to "CONTINUE".    *
      *Check that after approximately 5 min the*
      *GO caption is illuminated.  IF -        *
      *****************************************
            |              |
```

```
        |              |           ---------------------------------
        OK             NOT OK-----|The HOLD caption, binary pattern|
        |                         |address and N11 (N12), (N13) or |
        |                         |(N14) caption on the air intake |
        |                         |test panel are illuminated -    |
        |                         |shut down all four engines (Ref.|
        |                         |71-00-00); if failure number is |
        |                         |as follows:-                    |
        |                         | 7 - N11 caption illuminated -  |
        |                         |     *renew No.1 Engine Pulse   |
        |                         |     Probe (107).               |
        |                         | 8 - N12 caption illuminated -  |
        |                         |     *renew No.2 Engine Pulse   |
        |                         |     Probe (108).               |
        |                         | 9 - N13 caption illuminated -  |
        |                         |     *renew No.3 Engine Pulse   |
        |                         |     Probe (109).               |
        |                         |10 - N14 caption illuminated -  |
        |                         |     *renew No.4 Engine Pulse   |
        |                         |     Probe (110).               |
        |                          ---------------------------------
        |
D.******************************************
  *Set the intake test ON - OFF switch to  *
  *"OFF".  Shut down all four engines      *
  *(Ref. 71-00-00).  Set the RAMP - SPILL  *
  *master switches to "MAN"; press-to-     *
  *cancel the MWS red INT captions.  Switch*
  *off and disconnect electrical ground    *
  *power as detailed in 24-41-00.          *
  ******************************************
```

```
******************************       -------------------------------
*AN INTAKE N1 SIG AND LANE   *      |GROUND EQUIPMENT REQUIRED      |
*'A' LANE FAILURE CAPTIONS   *      |-------------------------------|
*REMAIN EXTINGUISHED WITH    *      |DESCRIPTION          PART NO.  |
*LANE 'B' LANE-IN-USE LAMP   *      |-------------------------------|
*ILLUMINATED WHEN POWER IS   *      |GROUND POWER SUPPLY    -       |
*SWITCHED ON.                *      |MULTIMETER             -       |
******************************       -------------------------------


 -----------        -----------         -----------
|Set AICS   |      |Press-to-  |       |Renew Board|
|controls as|      |test the N1|       |X (143),   |
|detailed in|----  |SIG and    |-YES-  |(148),(153)|
|2. Prepar- |      |LANE       |       |or (158),  |
|ation.     |      |failure    |       |If fault   |
 -----------       |captions.  |       |remains,   |
                   |Check that |       |renew Auto |
                   |each       |       |Control    |
                   |caption is |       |Panel (67).|
                   |illum-     |        -----------
                   |inated.    |
                    -----------
                         |
                         |
                         NO
                         |
                         |
 -----------        -----------
|Locate and |      |Check for  |
|rectify    |-YES- |28 V.d.c   |
|O/C.       |      |at terminal|
 -----------       |2 of CB    |
                   |(20),(21), |
                   |(21),(4) or|
                   |(3).       |
                    -----------
                         |
                         |
                         NO
                         |
                         |
                    -----------
                   |Renew CB   |
                   |(20),(21), |
                   |(4) or (3).|
                    -----------
```

Chart 101

```
*******************************          ------------------------------
*THE ALPHA FAILURE CAPTION IS *          |GROUND EQUIPMENT REQUIRED    |
*ILLUMINATED WHEN POWER IS    *          |-----------------------------|
*SWITCHED ON WITH LANE A      *          |DESCRIPTION         PART NO. |
*SELECTED.                    *          |-----------------------------|
*******************************          |GROUND POWER SUPPLY -        |
                                         ------------------------------
```

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 -----------        -----------        -----------
|Set the    |      |Set each   |      |Continue   |
|RAMP -     |------|lane       |-NO--|trouble    |
|SPILL      |      |selector   |      |shooting   |
|MASTER     |      |switch, in |      |until all  |
|switches to|      |turn, to   |      |four       |
|"AUTO" and |      |the "AUTO  |      |switches   |
|the lane   |      |B" pos-    |      |are set to |
|selector   |      |ition.     |      |"AUTO B".  |
|switches to|      |Check after|      |If caption |
|"AUTO A".  |      |each selec-|      |remains    |
|Connect and|      |tion has   |      |illuminated|
|switch on  |      |been made  |      |renew Auto |
|electrical |      |that the   |      |Control    |
|ground     |      |alpha fail-|      |Panel (67).|
|power.     |      |ure caption|       -----------
 -----------       |is ex-     |
                   |tinguished.|
NOTE:               -----------
During this              |
Trouble                 YES
Shooting it              |
must be             -----------
ensured            |Renew      |
that the           |*No.1A,    |
pitot/             |(2A),(3A)  |
static             |or (4A) Air|
system is          |Intake     |
not press-         |Control    |
urized,            |Unit (41), |
i.e.,              |(43),(45)  |
M = 0.             |or (47).   |
                    -----------
```

Chart 102

AN INTAKE "INT" FAILURE CAPTION IS ILLUMINATED AND THE LANE 'B' LANE-IN-USE LAMP IS EXTINGUISHED WITH THE N1 SIG AND LANE 'A' LANE FAILURE CAPTIONS ILLUMINATED WHEN POWER IS SWITCHED ON.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the AICS controls as detailed in 2. Preparation.

Set the lane selector switch to "B". Is fault cleared?

YES: Renew Auto Control Panel (67).

NO: Reset the lane selector switch to "AUTO A". Check for 28 V d.c. at terminal 2 of CB (28), (5), (36), or (22).

NO: Renew CB (28),(5), (36) or (22).

YES: Check continuity between pins P and Z of lane 1B (2B), (3B) or (4B) TEST socket on Interface Unit (180), (179),(182) or (181).

NO: Continue Trouble Shooting at paragraph L.

Continued on Sheet 2

Chart 103 (Sheet 1 of 2)

```
                                                  Continued from Sheet 1
                                                           |
                                                          YES
                                                           |
 -----------                -----------              -----------              -----------
|*Renew Auto|              |Check for  |            |Check for  |            |Renew Board|
|Control    |--NO-|28 V d.c.  |-YES-|28 V d.c.  |--NO-|Y (144),   |
|Panel (67) |              |at pin E of|            |at pin a   |            |(149),(154)|
 -----------               |lane 1B    |            |of lane 1A |            |or (159) in|
                           |(2B), (3B) |            |(2A),(3A)  |            |lane A.    |
                           |or (4B)    |            |or (44)    |             -----------
                           |TEST socket|            |TEST socket|
                           |on Inter-  |            |on Inter-  |
                           |face Unit  |            |face Unit  |
                           |(180),(179)|            |(179),(180)|
                           |(182) or   |            |(181) or   |
                           |(181).     |            |(182).     |
                            -----------              -----------
                                 |
                                YES
                                 |
                            -----------
                           |Renew Board|
                           |X (145),   |
                           |(150),(155)|
                           |or (160) in|
                           |lane B. If |
                           |fault      |
                           |remains,   |
                           |renew Board|
                           |Y (146),   |
                           |(151),(156)|
                           |or (161).  |
                            -----------
```

Chart 103 (Sheet 2 of 2)

```
*********************************
*AN INTAKE LANE 'B' "LANE"      *
*FAILURE CAPTION IS             *
*ILLUMINATED WITH LANE 'A'      *
*"LANE" AND "N1 SIG" FAILURE    *
*CAPTIONS, AND LANE 'B' LANE-   *
*IN-USE LAMP ILLUMINATED WHEN   *
*GROUND POWER IS SWITCHED ON.   *
*********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
 -----------      -----------         -----------         -----------
|Set the    |    |Remove     |       |Refit board|       |Return     |
|AICS       |----|Board X    |-YES-  |X and int- |-YES-  |No.1,(3),  |
|controls as|    |(145),     |       |erchange   |       |(5),(7)    |
|detailed in|    |(150),(155)|       |the posit- |       |AICU to its|
|2.Preparat-|    |or (160)   |       |ions of    |       |location   |
|ion.       |    |from lane  |       |No.1 (3),  |       |and renew  |
 -----------     |B. Check   |       |(5),(7) and|       |No.2 (4),  |
                 |for        |       |No.2 (4),  |       |(6),(8)    |
                 |continuity |       |(6),(8)    |       |AICU (42), |
                 |between    |       |AICUs.     |       |(44),(46)  |
                 |pins 28 and|       |Check that |       |or (48).   |
                 |32 on the  |       |fault has  |        -----------
                 |board.     |       |cleared.   |
                  -----------         -----------
                       |                   |
                       NO                  NO
                       |                   |
                  -----------         -----------
                 |Renew Board|       |Return No.1|
                 |X (145),   |       |(3),(5),(7)|
                 |(150),(155)|       |AICU to its|
                 |or (160).  |       |correct    |
                  -----------        |location   |
                                     |and renew  |
                                     |the Auto   |
                                     |Control    |
                                     |Panel (67).|
                                      -----------
```

Chart 104

```
**********************************       ------------------------------
*AN INTAKE "HYD" FAILURE         *      |GROUND EQUIPMENT REQUIRED     |
*CAPTION IS ILLUMINATED WITH     *      |------------------------------|
*THE N1 SIG AND LANE 'A'         *      |DESCRIPTION           PART NO.|
*"LANE" FAILURE CAPTIONS AND     *      |------------------------------|
*THE LANE 'B' LANE-IN-USE LAMP*         |GROUND POWER SUPPLY   -       |
*ILLUMINATED WHEN GROUND POWER*         |MULTIMETER            -       |
*SWITCHED ON.                    *       ------------------------------
**********************************
```

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 -----------       -----------        -----------
|Set the    |     |Set the    |      |Renew Auto f
|AICS       |-----|hydraulic  |--NO--|Control    |
|controls as|     |selector   |      |Panel (67).|
|detailed in|     |switch to  |       -----------
|2.Prepar-  |     |"YELLOW".  |
|ation.     |     |Check that |
 -----------      |the HYD    |
                 fcaption is  |
                  |exting-    |
                  |uished.    |
                   -----------
                       |
                       |
                      YES
                       |
             Continued on Sheet 2
```

Chart 105 (Sheet 1 of 4)

Continued from Sheet 1

```
                          |
                     -----------           -----------            -----------
                    |Remove     |         |Check for  |          |Continued  |
                    |board Y    |-YES-    |continuity |-YES-     |on Sheet 3.|
                    |(144),(149)|         |between    |           -----------
                    |(154) or   |         |pins 30 and|
                    |(159)      |         |16 on board|
                    |from lane  |         |Y.         |
                    |A and check|          -----------
                    |for earth  |               |
                    |potential  |               |
                    |at pin 30  |               NO
                    |of fixed   |               |
                    |edge con-  |          -----------
                    |nector in  |         |Renew Board|
                    |Interface  |         |Y (144),   |
                    |Unit (179),|         |(149),(154)|
                    |(180),(181)|         |or (159).  |
                    |or (182).  |          -----------
                     -----------
                          |
                          NO
                          |
  -----------        -----------           -----------
 |Locate and |      |Check for  |         |Renew diode|
 |rectify    |-YES- |earth      |--NO-    |on Board   |
 |O/C.       |      |potential  |         |(177) or   |
  -----------       |at pin G   |         |(178).     |
                    |(F) of     |          -----------
                    |connector  |
                    |K2337-A    |
                    |(Nos.1 and |
                    |2 intakes) |
                    |or pin G   |
                    |(F) of     |
                    |connector  |
                    |K2338-A    |
                    |(Nos.3 and |
                    |4 intakes) |
                    |on Diode   |
                    |Board (177)|
                    |or (178).  |
                     -----------
```

Chart 105 (Sheet 2 of 4)

Continued from
Sheet 2

```
                 -----------       -----------
                |Refit board|     |Continue   |
        -YES--  |Y and reset|--NO-|trouble    |
                |hydraulic  |     |shooting at|
                |selector   |     |paragraph  |
                |switch to  |     |L.         |
                |"AUTO"     |      -----------
                |before     |
                |restoring  |
                |ground     |
                |power.     |
                |Check for  |
                |earth      |
                |potential  |
                |at pin G of|
                |lane 1A    |
                |(2A),(3A)  |
                |or (4A)    |
                |TEST socket|
                |on Inter-  |
                |face Unit  |
                |(179),     |
                |(180),(181)|
                |or (182).  |
                 -----------
                      |
                     YES
                      |
                 -----------       -----------
                |Check for  |     |Renew *Auto|
                |earth      |-YES-|Control    |
                |potential  |     |Panel (67).|
                |at pin B of|      -----------
                |lane 1A    |
                |(2A), (3A) |
                |or (4A)    |
                |TEST socket|
                |on Inter-  |
                |face Unit  |
                |(179),     |
                |(180) (181)|
                |or (182).  |
                 -----------
                      |
                      NO
                      |
```

Continued on Sheet 4

Chart 105 (Sheet 3 of 4)

Continued from Sheet 3

```
Renew Board Y (144) (149),(154) or (159), If fault remains, renew Board X (143), (148),(153) or (158).
        |
       YES
        |
Check for 28 V d.c. at pin E of lane 1A (2A),(3A) or (4A) TEST socket on Interface Unit (179) (180),(181) or (182).
```

```
Check for 28 V d.c. at pin M of lane 1A (2A),(3A) or (4A) TEST socket on Interface Unit (179), (180),(181) or (182).
  -YES-> Check for 28 V d.c. at pin F of lane 1A (2A),(3A) or (4A) TEST socket on Interface Unit (179), (180),(181) or (182).
  -YES-> Check for 28 V d.c. at pin E of lane 1A (2A),(3A) or (4A) TEST socket on Interface Unit (179) (180),(181) or (182).

Pin M check -NO-> Check for 28 V d.c. at terminal 2 of CB (1) f(26),(19) or (33).
    --NO-> Renew CB (1),(26) (19) or (33).
    -YES-> Locate and rectify O/C.

Pin F check -NO-> Check for 28 V d.c. at terminal 2 of CB (5) (28),(22) or (36).
    -YES-> Renew *Auto Control Panel (67).
    -NO-> Renew CB (5) (28),(22) or (36).

Pin E check -NO-> Renew *Auto Control Panel (67).
```

Chart 105 (Sheet 4 of 4)

```
**********************************
*THE "HYD" FAILURE CAPTIONS FOR*
*INTAKES 1 AND 2 (3 AND 4) ARE *
*ILLUMINATED WITH THE "N1 SIG" *
*AND LANE 'A' "LANE" FAILURE   *
*CAPTIONS AND THE LANE 'B'     *
*LANE-IN-USE LAMP ILLUMINATED  *
*WHEN GROUND POWER IS SWITCHED *
*ON.                           *
**********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 -----------      -----------         -----------         -----------
|Set the    |    |Check for  |       |Check for  |       |*Renew Low |
|AICS       |----|earth      |--NO---|earth      |-YES---|Level      |
|controls as|    |potential  |       |potential  |       |Switch     |
|detailed in|    |at pin T of|       |at pin B of|       |(163) or   |
|2.Prepar-  |    |connector  |       |connector  |       |(164).     |
|ation.     |    |K2337-A    |       |D47-A      |        -----------
 -----------     |(Nos. 1 and|       |(intakes 1 |
                 |2 intakes) |       |and 2 or   |
                 |or K2338-A |       |D49-A (in- |
                 |(Nos. 3 and|       |takes 3 and|
                 |4 intakes) |       |4) on Low  |
                 |on Diode   |       |Level      |
                 |Board (177)|       |Switch     |
                 |or (178).  |       |(163) or   |
                  -----------        |(164).     |
                       |              -----------
                       |                   |
                      YES                  NO
                       |                   |
                  -----------              |
                 |Locate and |             |
                 |rectify O/C|             |
                 |on Diode   |             |
                 |Board (177)|             |
                 |or (178).  |             |
                  -----------              |
                                     Continued on
                                     Sheet 2
```

Chart 106 (Sheet 1 of 2)

Continued from Sheet 1

```
                 |
 -----------            -----------
|Check for  |          |*Renew Low |
|earth      |-YES-     |Pressure   |
|potential  |          |Switch     |
|at pin A   |          |(166) or   |
|of con-    |          |(167).     |
|nector     |           -----------
|K2180-A    |
|(intakes 1 |
|and 2) or  |
|K2183-A    |
|(intakes 3 |
|and 4) on  |
|Low Press- |
|ure Switch |
|(166) or   |
|(167).     |
 -----------
      |
      NO
      |
 -----------
|Locate and |
|rectify O/C|
|in earth   |
|return     |
|line.      |
 -----------
```

Chart 106 (Sheet 2 of 2)

```
********************************
*"HYD" FAILURE CAPTION         *
*ILLUMINATED WITH "N1 SIG",    *
*LANE 'A' AND "INT FAILURE     *
*CAPTIONS ILLUMINATED AND BOTH*
*LANE-IN-USE LAMPS             *
*EXTINGUISHED WHEN OPERATING   *
*IN CONJUNCTION WITH THE       *
*YELLOW HYDRAULIC SYSTEM.      *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 -----------         -----------
|Set the    |       |Check for   |
|RAMP SPILL |       |earth       |
|MASTER     |-------|potential   |-YES-Continued on Sheet 3.
|switch to  |       |at pin B of |
|"MAN",and  |       |lane 1B,    |
|the hydrau-|       |(2B),(3B)   |
|lic selec- |       |or (4B)     |
|tor switch |       |TEST        |
|to         |       |connector   |
|"YELLOW".  |       |on          |
|Reset the  |       |Interface   |
|RAMP-      |       |Unit (180), |
|SPILL      |       |(182)or     |
|MASTER     |       |(181).      |
|switch to  |        -----------
|"AUTO" and |             |
|set the    |             NO
|lane selec-|             |
|tor switch |       Continued on
 to "A".    |       Sheet 2
 -----------
```

Chart 107 (Sheet 1 of 3)

```
                           Continued from
                           Sheet 1
                                |
                            -----------            -----------            -----------
                           |Check for  |          |Check for  |          |Renew Board|
                           |earth      |-YES-     |28 V d.c.  |-YES-     |Y in lane B|
                           |potential  |          |at pin F of|          |(146),     |
                           |at pin G of|          |lane 1B,   |          |(151),(156)|
                           |lane 1B,   |          |(2B),(3B)  |          |or (161).  |
                           |(2B),(3B)  |          |or (4B)    |          |If fault   |
                           |or (4B)    |          |TEST con-  |          |remains,   |
                           |TEST con-  |          |nector on  |          |renew Board|
                           |nector on  |          |Interface  |          |(144),     |
                           |Interface  |          |Unit (180),|          |(149),(154)|
                           |Unit (180),|          |(179),(182)|          |or (159) in|
                           |(179),(182)|          |or (181).  |          |lane A.    |
                           |or (181).  |           -----------            -----------
                            -----------                 |
                                f                       |
                                NO                      NO
                                |                       |
  -----------               -----------            -----------
 |Locate and |             |Check for  |          |Renew Auto |
 |rectify O/C|-YES-        |earth      |          |Control    |
 |between pin|             |potential  |          |Panel (67).|
 |33 on board|             |at pin M on|           -----------
 |Y in lane  |             |Diode Board|
 |1B (2B),   |             |(177).     |
 |(3B) or    |              -----------
 |(4B) and   |                  |
 |pin M on   |                  NO
 |Diode Board|                  |
 |(177).     |              -----------
  -----------              |*Renew Low |
                           |Pressure   |
                           |Switch     |
                           |(168).     |
                            -----------
```

Chart 107 (Sheet 2 of 3)

```
Continued                  -----------        -----------
from Sheet 1 -YES-|Check for   |-YES-|Renew Low   |
                  |earth       |     |Level       |
                  |potential   |     |Switch      |
                  |at pin Y of |     |(165).      |
                  |lane 1B,    |      -----------
                  |(2B),(3B)   |
                  |or (4B)     |
                  |TEST con-   |
                  |nector on   |
                  |Interface   |
                  |Unit (180), |
                  |(179),(182) |
                  |or (181).   |
                   -----------
                        |
                        NO
                        |
                   -----------        -----------
                  |Remove      |     |Renew Auto  |
                  |board Y     |-YES-|Control     |
                  |from lane   |     |Panel (67). |
                  |1B,(2B),    |      -----------
                  |(3B) or     |
                  |(4B) and    |
                  |check con-  |
                  |tinuity     |
                  |between     |
                  |pins 16 and |
                  |30 on the   |
                  |board.      |
                   -----------
                        |
                        NO
                        |
                   -----------
                  |Renew board |
                  |Y (146),    |
                  |(151),(156) |
                  |or (161).   |
                   -----------
```

Chart 107 (Sheet 3 of 3)

A RAMP DOES NOT LOWER WHEN THE MANUAL INCHING SWITCH IS SET TO "LOWER" WITH THE YELLOW HYDRAULIC SYSTEM SELECTED.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the AICS controls as detailed in 2.Preparation. Switch on electrical ground power. Set RAMP - SPILL MASTER switch to "MAN", and the hydraulic selector switch to "YELLOW".

Disconnect connectors 1K1702 - F and H, (2K1702 - F and H), (3K1702 - F and H) or (4K1702 - F and H) from the ramp actuator. Hold the RAMP inching switch at "LOWER", check (between supply and earth) that a 28 V d.c. supply is present at pin A on connector H and that a d.c. supply is present between pins A and B on connector F.

NO:

1. No supply at connectors F and H - continue on Sheet 2.
2. No supply at the standby selector valve connector (H) - continue on Sheet 3.
3. No supply at the standby servo valve connector (F) - continue on Sheet 4.

NOTE: All test readings are made with the RAMP inching switch held in the LOWER position.

YES

Continued on Sheet 2

Chart 108 (Sheet 1 of 6)

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Continued from Sheet 1

Check for 28 V d.c. between pins A and C on the standby selector valve connector 1K1702-H, (2K1702-H), (3K1702-H) or (4K1702-H).

--NO-- Locate and rectify O/C between pin C on the standby selector valve connector and the associated earth point.

YES

Check continuity of winding of Servo Valve (97), (98), (99) or (100).

--NO-- Renew Servo Valve (97), (98), (99) or (100).

YES

Check continuity of winding of Selector Valve (101) (102), (103) or (104).

--NO-- Renew Selector Valve (101) (102), (103) or (104).

-YES- Refer to 71-00-41, Trouble Shooting.

Chart 108 (Sheet 2 of 6)

```
 -----------        -----------         -----------         -----------
|Continued  |      |Check for   |-YES-|Check for   |-YES-|Renew        |
|from Sheet |------|28 V d.c.   |     |28 V d.c.   |     |*Manual      |
|1. (No     |      |at pin M of |     |at pin e of |     |Control      |
|supply at  |      |of lane 1B  |     |lane 1B     |     |Panel (68).  |
|connectors |      |(2B),(3B)   |     |(2B),(3B)   |      -----------
|F and H)   |      |or (4B)     |     |or (4b)     |
 -----------       |TEST socket |     |TEST socket |
                   |on Inter-   |     |on Inter-   |
                   |face Unit   |     |face Unit   |
                   |(180),(179) |     |(180),(179) |
                   |(182) or    |     |(182) or    |
                   |(181).      |     |(181).      |
                    -----------         -----------
                         |                   |
                         NO                  NO
                         |                   |
                         |                   |
 -----------        -----------         -----------
|Locate and |      |Check for    |     |Renew Board |
|rectify    |-YES-|28 V d.c. at |     |Y (146),    |
|O/C.       |      |terminal 2   |     |(151),(156) |
 -----------       |of CB (34),  |     |or (161).   |
                   |(2), (27)    |      -----------
                   |or (18).     |
                    ------------
                         |
                         NO
                         |
                    -----------
                   |Renew CB    |
                   |(34),(2),   |
                   |(18).       |
                    -----------
```

Chart 108 (Sheet 3 of 6)

Continued from Sheet 1.(No supply at standby selector valve connector (H))

Check for 28 V d.c. at pin H of of lane 1B (2B),(3B) or (4B) TEST connector on Interface Unit (180) (179),(182) or (181).

--NO--

Check for 28 V d.c. at pin W of lane 1B (2B),(3B) or (4B) TEST connector on Interface Unit (180), (179),(182) or (181).

--NO--

Locate and rectify O/C between pin 36 on board Y (146), (151),(156) or (161) and pin 36 on board X (145),(150) (155),(160) at Interface Unit (180),(179) (182) or (181).

YES (from pin W check)

Renew Board Y (146), (151),(156) or (161).

YES (from pin H check)

Locate and rectify O/C between pin 17 on board Y interface connector in lane B and pin A on the standby selector valve connector 1K1702-H, (2K1702-H), (3K1702-H) or (4K1702-H).

Chart 108 (Sheet 4 of 6)

Continued from Sheet 1. (No supply at standby servo valve connector (F))

--NO-→

Check for d.c. supply at pin L of lane 1B (2B),(3B) or (4B) TEST connector on Interface Unit (180), (179),(182) or (181).

- NO → Renew Board X (145), (150),(155) or (160). If fault remains, renew Board Y (146), (151),(156) or (161).
- YES → Check for d.c.supply at pin N of lane 1B (2B),(3B) or (4B) TEST connector on Interface Unit (180), (179),(182) or (181).
  - NO → Locate and rectify O/C from pin 48 on board X (145),(150) (155) or (160) via connector 1K1702-F, (2K1702-F), (3K1702-F) or (4K1702-F) to pin 49 on board X Interface connector in Interface Unit (180),(179) (182) or or (181).
  - YES → Check for d.c. supply at pin X of lane 1B (2B),(3B) or (4B) TEST connector on Interface Unit (180), (179),(182) or (181).
    - NO → Renew Board X (145), (150),(155) or (160).
    - YES → Continued on Sheet 6

Chart 108 (Sheet 5 of 6)

Continued from
Sheet 5

```
                          |
                     -----------          -----------
                    |Remove     |        |Renew Board|
                    |board Y in |--NO-   |Y (146),   |
                    |Lane 1B    |        |(151),(156)|
                    |(2B),(3B)  |        |or (161).  |
                    |or (4B)    |         -----------
                    |from       |
                    |Interface  |
                    |Unit (180),|
                    |(179),(182)|
                    |or (181).  |
                    |Check for  |
                    |continuity |
                    |between    |
                    |pins 24 and|
                    |37 on the  |
                    |board.     |
                     -----------
                          |
                         YES
                          |
 -----------         -----------          -----------
|Locate and |-YES-  |Check for  |--NO-   |Renew      |
|rectify O/C|       |continuity |        |Manual     |
|at board Y |       |between pin|        |Inching    |
|connector. |       |24 of board|        |Potentio-  |
 -----------        |Y connector|        |meter (114)|
                    |in Lane    |        |(122),(130)|
                    |1B (2B),   |        |or (138).  |
                    |(3B) or    |        |Refit board|
                    |(4B) and   |        |Y.         |
                    |earth, in  |         -----------
                    |Interface  |
                    |Unit (180),|
                    |(179),(182)|
                    |or (181).  |
                     -----------
```

Chart 108 (Sheet 6 of 6)

```
*******************************
*A RAMP DOES NOT RISE WHEN THE*
*MANUAL INCHING SWITCH IS SET *
*TO "RAISE" WITH THE YELLOW   *
*HYDRAULIC SYSTEM SELECTED.   *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

<u>NOTE:</u> Before renewal of components (*), check the associated wiring for continuity.

```
 -----------        -----------         -----------
|Set the    |      |Check d.c. |       |*Renew     |
|RAMP -     |------|supply at  |--NO-- |Manual     |
|SPILL      |      |pin X of   |       |Control    |
|MASTER     |      |test con-  |       |Panel (68).|
|switch to  |      |nector TEST|        -----------
|"MAN" and  |      |1B,(2B),   |
|the hydr-  |      |(3B) or    |
|aulic      |      |(4B) at    |
|selector   |      |Interface  |
|switch to  |      |Unit (180),|
|"YELLOW".  |      |(179),(182)|
 -----------       |or (181).  |
                    -----------
                        |
                       YES
                        |
NOTE: All test      -----------         -----------
      readings     |Check d.c. |       |Renew Board|
      are made     |supply at  |--NO-- |Y (146),   |
      with the     |pin H of   |       |(151),(156)|
      RAMP         |test con-  |       |or (161) in|
      inching      |nector TEST|       |lane 1B    |
      switch       |1B,(2B),   |       |(2B),(3B)  |
      held in      |(3B) or    |       |or (4B).   |
      the RAISE    |(4B) at    |        -----------
      position.    |Interface  |
                   |Unit (180),|
                   |(179),(182)|
                   |or (181).  |
                    -----------
                        |
                       YES
                        |
```

Continued on Sheet 2

Chart 109 (Sheet 1 of 2)

Continued from Sheet 2

Remove Board Y in Lane 1B, (2B),(3B) or (4B) from Interface Unit (180),(179) (182) or (181). Check continuity between pins 25 and 36 on the board.

--NO-- Remove Board Y (146), (151),(156) or (161) in lane 1B (2B),(3B) or (4B).

YES

Check continuity between pin 25, at board Y connector in the Interface Unit, lane 1B, (2B), (3B) or (4B), and earth.

-YES- Locate and rectify O/C at board Y connector. Refit board Y.

--NO- Renew Manual Inching Potentiometer (113) (121),(125) or (137). Refit board Y.

Chart 109 (Sheet 2 of 2)

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A SPILL DOOR DOES NOT OPEN WHEN THE MANUAL INCHING SWITCH IS SET TO "OPEN" WITH THE YELLOW HYDRAULIC SYSTEM SELECTED.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the RAMP - SPILL MASTER switch to "MAN" and the hydraulic selector to "YELLOW".

→

At the Spill Door Actuator (81),(82),(83) or (84), disconnect the connectors 1K1703-A, (2K1703-A), (3K1703-A), or (4K1703-A), 1K1705-C and D, (2K1705-C and D) (3K1705-C and D) or (4K1705-C and D) from the spill door selector valve, and the spill door servo and unlock valves. Hold the SPILL inching switch at "OPEN" and check between supply and earth that a 28 V d.c. supply is present at pin A of connectors A and D and a d.c. supply is present between pins A and B of connector C.

-NO- →

1. No supply at connectors A, C and D - renew *Manual Control Panel (68).
2. No supply at the selector valve and unlock valve connectors A and D - Sheet 4.
3. No supply at the spill door selector valve connector A - Sheet 3.
4. No supply at the spill door unlock valve connector D. Sheet 4.
5. No supply at the spill door servo valve connector C - Sheet 5.

NOTE: All test readings are made with the SPILL inching switch held in the OPEN position.

YES ↓

Check for 28 V d.c. between pins A and C of the spill door selector valve connector 1K1703-A, (2K1703-A), (3K1703-A) or (4K1703-A).

-NO- →

Locate and rectify O/C between pin C on the spill door selector valve connector and the associated earth point.

YES ↓

Continued on Sheet 2

Chart 110 (Sheet 1 of 6)

```
                                        |
                          Continued from Sheet 1
                                        |
 -----------          ---------------------------
|Locate and |        |Check for 28 V d.c. between|
|rectify O/C|        |pins A and C of the spill  |
|between pin|-NO--   |door unlock valve connec-  |
|C on the   |        |tor 1K1705-C, (2K1705-C),  |
|spill door |        |(3K1705-C) or (4K1705-C).  |
|unlock     |         ---------------------------
|valve con- |                      |
|nector and |                      |
|the assoc- |                     YES
|iated earth|                      |
|point.     |                      |
 -----------                       |
                                   |
 -----------          ---------------------------
|Renew      |        |Check continuity of the    |
|Standby    |--NO-   |winding of the Standby Sel-|
|Selector   |        |ector Valve (86),(88),(90) |
|Valve (86),|        |or (92).                   |
|(88),(90)  |        ---------------------------
|or (92).   |                     |
 -----------                     YES
                                  |
 -----------          ---------------------------
|Renew      |        |Check continuity of the    |
|Unlock     |--NO-   |winding of the Unlock Valve|
|Valve (183)|        |(183),(184),(185) or (186).|
|(184),(185)|         ---------------------------
|or (186).  |                     |
 -----------                     YES
                                  |
 -----------          ---------------------------
|Renew Servo|        |Check continuity of the    |
|Valve (187)|-NO--   |Servo Valve (187),(188),   |
|(188),(189)|        |(189) or (190).            |
|or (190).  |         ---------------------------
 -----------
```

Chart 110 (Sheet 2 of 6)

Continued from Sheet 1. (No supply at the spill door selector valve connector A)

Check for 28 V d.c. at pin J of test connector TEST 1B,(2B), (3B) or (4B) on Interface Unit (180), (179),(182) or (181).

--NO-- Remove board Z from Interface Unit (180),(179) (182) or (181). Check for 28 V d.c. at pin 24 of board Z connector in Interface Unit.

-YES- Renew AICU (42),(44), (46) or (48).

NO

Check for 28 V d.c. at pin 31 of board Z connector in Interface Unit.

-YES- Renew Board Z (147), (152),(157) or (162).

NO

*Renew Board Y (146),(151) (156) or (161).

YES

Locate and rectify O/C between pin 39 on board Z connector in Interface Unit (180),(179) (182) or (181) and pin A on the selector valve connector 1K1703-A, (2K1703-A), (3K1703-A) or (4K1703-A).

Chart 110 (Sheet 3 of 6)

Continued from Sheet 1. (No supply at the selector valve and unlock valve connectors A and D)

Check for 28 V d.c. at pin U of test connector TEST 1B,(2B),(3B), or (4B) at Interface Unit (180),(179),(182) or (181).

-YES- Renew Board Y (146),(151),(156) or (161).

NO

Locate and rectify O/C between pin 40 on board X connector and pin 40 on board Y connector in lane 1B,(2B),(3B) or (4B).

Continued from Sheet 1. (No supply at the spill door unlock valve connector D)

Check for 28 V d.c. at pin K of test connector TEST 1B, (2B),(3B) or (4B) on Interface Unit (180), (179),(182) or (181).

-YES- Locate and rectify O/C between pin 9 of board Y connector and pin A of the unlock valve connector 1K1705-D, (2K1705-D), (3K1705-D) or (4K1705-D)

NO

Renew Board Y (146), (151),(156) or (161).

Chart 110 (Sheet 4 of 6)

Continued from Sheet 1. (No supply at the spill door servo valve connector C)

Check for d.c. supply supply at pin R of test connector TEST 1B, (2B), (3B) or (4B) on Interface Unit (180) (179),(182) or (181).

-YES-

Check for d.c. supply at pin f of test connector TEST 1B, (2B),(3B), or (4B).

--NO-

Locate and rectify O/C in the servo valve connector circuit from board X connector pin 44, via connector 1K1705-C, (2K1705-C), (3K1705-C) or (4K1705-C), back to pin 45 of board X connector in lane 1B, (2B),(3B) or (4B).

NO

Renew Board X (145), (150),(155) or (160).

YES

Check for d.c. supply at pin V of test connector TEST 1B, (2B),(3B), or (4B).

--NO-

*Renew Board X (145),(150) (155) or (160).

YES

Continued on Sheet 6

Chart 110 (Sheet 5 of 6)

```
                                         |
                                  Continued from Sheet 5
                                         |
                                  -----------        -----------
                                 |Remove     |      |Renew Board|
                                 |board Y    |--NO-|Y (146),   |
                                 |from lane  |      |(151),(156)|
                                 |1B, (2B),  |      |or (161).  |
                                 |(3B) or    |       -----------
                                 |(4B). Check|
                                 |continuity |
                                 |between    |
                                 |pins 28 and|
                                 |41 on the  |
                                 |board.     |
                                  -----------
                                       |
                                      YES
                                       |
           -----------            -----------        -----------
          |*Renew     |          |Check con- |      |Locate and |
          |Manual     |--NO-     |tinuity be-|-YES-|rectify O/C|
          |Inching    |          |tween pin  |      |at board Y |
          |Potentio-  |          |28 at board|      |connection |
          |meter (118)|          |Y connector|      |with Inter-|
          |(126),(134)|          |in the     |      |face       |
          |or (142).  |          |Interface  |      |connector. |
          |Refit board|          |unit and   |      |Refit board|
          |Y.         |          |earth.     |      |Y.         |
           -----------            -----------        -----------
```

Chart 110 (Sheet 6 of 6)

```
********************************          -----------------------------
*A SPILL DOOR DOES NOT SHUT    *         |GROUND EQUIPMENT REQUIRED    |
*WHEN THE MANUAL INCHING       *         |-----------------------------|
*SWITCH IS SET TO "SHUT" WITH  *         |DESCRIPTION          PART NO.|
*THE YELLOW HYDRAULIC SYSTEM   *         |-----------------------------|
*SELECTED.                     *         |GROUND POWER SUPPLY  -       |
********************************         |MULTIMETER           -       |
                                          -----------------------------
```

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 -----------      -----------       -----------
|Set the    |    |Check for  |     |*Renew     |
|RAMP -     |----|28 V d.c.  |--NO-|Manual     |
|SPILL      |    |at pin V   |     |Control    |
|MASTER     |    |of test    |     |Panel (68).|
|switch to  |    |connector  |      -----------
|to "MAN"   f    |TEST 1B,   |
|and the    |    |(2B),(3B)  |
|hydraulic  |    |or (4B) on |
|selector   |    |Interface  |
|switch to  |    |Unit (180),|
|"YELLOW".  |    |(179),(182)|
|Hold the   |    |or (181).  |
|SPILL      |     -----------
|inching    |          |
|switch at  |         YES
|the "SHUT" |          |
|position.  |     -----------       -----------
 -----------     |Check for  |     |Renew Board|
                 |28 V d.c.  |--NO-|Y (146),   |
                 |at pin K of|     |(151),(156)|
NOTE: All test   |test con-  |     |or (161).  |
      readings   |nector TEST|      -----------
      are made   |1B,(2B),   |
      with the   |(3B) or    |
      SPILL      |(4B) on    |
      inching    |Interface  |
      switch     |Unit (180),|
      held at    |(179),(182)|
      the SHUT   |or (181).  |
      position.   -----------
                       |
                      YES
                       |
```

Continued on Sheet 2

Chart 111 (Sheet 1 of 2)

Continued from Sheet 1

```
 -----------               -----------
|Remove     |             |Renew Board|
|board Y    |--NO-        |Y (146),   |
|from lane  |             |(151),(156)|
|1B,(2B),   |             |or (161).  |
|(3B) or    |              -----------
|(4B) from  |
|Interface  |
|Unit (180),|
|(179),(182)|
|or (181).  |
|Check con- |
|tinuity be-|
|tween pins |
|29 and 40  |
|on the     |
|board.     |
 -----------
      |
     YES
      |
 -----------               -----------
|Check con- |             |Renew      |
|tinuity    |--NO-        |Manual     |
|between pin|             |Inching    |
|29 of board|             |Potentio-  |
|Y connector|             |meter (117)|
| in the    |             |(125),(133)|
|interface  |             |or (141).  |
|unit and   |             |Refit board|
|earth.     |             |Y.         |
 -----------               -----------
      |
     YES
      |
 -----------
|Locate and |
|rectify O/C|
|at board Y |
|connection |
|with Inter-|
|face con-  |
|nector. Re-|
|fit board  |
|Y.         |
 -----------
```

Chart 111 (Sheet 2 of 2)

****

A RAMP DOES NOT LOWER WHEN THE MANUAL INCHING SWITCH IS SET TO "LOWER" WITH THE MAIN HYDRAULIC SYSTEM SELECTED.

****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set AICS controls as detailed in 2. Preparation. Switch on electrical ground power. Set RAMP - SPILL MASTER switch to "MAN", and the hydraulic selector switch to "AUTO".

Disconnect connectors 1K1702 - C and D, (2K1702 - C and D) (3K1702 - C and D), or (4K1702 - C and D) from the ramp actuator. Hold RAMP inching switch at "LOWER"; check (between supply and earth) that a 28 V d.c. supply is present at pin A of connector D and a d.c. supply is present between pins A and B of connector C

-NO-

1.No supply at connectors C and D - continue on Sheet 2.
2.No supply at the main selector valve connector D - continue on Sheet 3.
3.No supply at the main servo valve connector C - continue on Sheet 4.

YES

NOTE: All test readings are made with the RAMP inching switch held in the LOWER position.

Check for 28 V d.c. between pins A and C of the main selector valve connector 1K1702-D, (2K1702-D), (3K1702-D) or (4K1702-D).

-NO-

Locate and rectify O/C between pin C on the main selector valve connector and the associated earth point.

Continued on Sheet 2

YES

Chart 112 (Sheet 1 of 5)

```
                                         Continued from Sheet 1
                                                |
                     -----------          -----------
                    |Renew Servo|        |Check con- |
                    |Valve (191)|--NO-|tinuity of |
                    |(192),(193)|        |winding of |
                    |or (194).  |        |Servo Valve|
                     -----------         |(201),(202)|
                                         |(203) or   |
                                         |(204).     |
                                          -----------
                                               |
                                              YES
                                               |
                     -----------          -----------          -----------
                    |Renew Sel- |        |Check con- |        |Refer to   |
                    |ector Valve|--NO-|tinuity of |-YES-|Trouble    |
                    |(205),(206)|        |winding of |        |Shooting.  |
                    |(207) or   |        |Selector   |         -----------
                    |(208).     |        |Valve (205)|
                     -----------         |(206),(207)|
                                         |or (208).  |
                                          -----------

  -------------                           -----------          -----------
 |Continued    |                         |Check for  |        |*Renew     |
 |from Sheet 1.|-------------------------|28 V d.c.  |-YES-|Manual     |
 |(No supply   |                         |at pin e of|        |Control    |
 |at connectors|                         |lane 1A    |        |Panel (68).|
 |C and D)     |                         |(2A),(3A)  |         -----------
  -------------                          |or (4A)    |
                                         |TEST socket|
                                         |on Inter-  |
                                         |face Unit  |
                                         |(179),(180)|
                                         |(181) or   |
                                         |(182).     |
                                          -----------
                                               |
                                              NO
                                               |
                                          -----------
                                         |Renew Board|
                                         |Y (144),   |
                                         |(149),(154)|
                                         |or (159).  |
                                          -----------
```

Chart 112 (Sheet 2 of 5)

```
 -----------      -----------       -----------       -----------
|Continued  |    |Check for  |     |Check for  |     |Locate and |
|from Sheet |-NO-|28 V d.c.  |-NO- |28 V d.c.  |-NO- |rectify O/C|
|1. (No     |    |at pin H of|     |at pin W of|     |between pin|
|supply at  |    |lane 1A    |     |lane 1A    |     |36 of board|
|connector  |    |(2A),(3A), |     |(2A),(3A)  |     |Y (144),   |
|D)         |    |or (4A)    |     |or (4A)    |     |(149),(154)|
 -----------     |TEST con-  |     |TEST con-  |     |or (159)   |
                 |nector on  |     |nector on  |     |and pin 36 |
                 |Interface  |     |Interface  |     |of Board X |
                 |Unit (179),|     |Unit (179),|     |(143),(148)|
                 |(180),(181)|     |(180),(181)|     |(153) or   |
                 |or (182).  |     |or (182).  |     |(158) at   |
                  -----------       -----------      |Interface  |
                       |                 |           |Unit (179),|
                      YES               YES          |(180),(181)|
                       |                 |           |or (182)   |
                  -----------       -----------       -----------
                 |Locate and |     |Renew Board|
                 |rectify O/C|     |Y (144),   |
                 |between pin|     |(149),(154)|
                 |17 of board|     |or (159).  |
                 |Y interface|      -----------
                 |connector  |
                 |in lane A  |
                 |and pin A  |
                 |on the     |
                 |standby    |
                 |selector   |
                 |valve      |
                 |connector. |
                  -----------
```

Chart 112 (Sheet 3 of 5)

Continued from Sheet 1. (No supply at connector C).

--NO--

Check for d.c. supply at pin L of lane 1A (2A),(3A) or (4A) TEST connector on Interface Unit (179),(180) (181) or (182).

-YES-

Check for d.c. supply at pin N of lane 1A (2A),(3A) or (4A) TEST connector on Interface Unit (179),(180) (181) or (182).

--NO--

Locate and rectify O/C from pin 48 on Board X (143),(148) (153) or (158) via connector 1K1702-C, (2K1703-C), (3K1702-C) or (4K1702-C) to pin 49 of board X connector in Interface Unit (179),(180) (181) or (182).

(From "Check for d.c. supply at pin L ...") NO

Renew Board X (143), (148),(153) or (158). If fault remains, renew Board Y (144), (149),(154) or (159).

(From "Check for d.c. supply at pin N ...") YES

Check for d.c. supply at pin X of lane 1A (2A),(3A) or (4A) TEST connector on Interface Unit (179),(180) (181) or (182).

--NO--

Renew Board X (143), (148),(153) or (158).

YES

Continued on Sheet 5

Chart 112 (Sheet 4 of 5)

```
                                  Continued from Sheet 4
                                            |
                                  -----------            -----------
                                 |Remove     |          |Renew Board|
                                 |board Y in |--NO-|Y (144),   |
                                 |lane 1A    |          |(149),(154)|
                                 |(2A),(3A)  |          |or (159).  |
                                 |or (4A)    |           -----------
                                 |from Inter-|
                                 |face Unit  |
                                 |(179),(180)|
                                 |(181) or   |
                                 |(182).Check|
                                 |for contin-|
                                 |uity be-   |
                                 |tween pins |
                                 |24 and 37  |
                                 |on the     |
                                 |board.     |
                                  -----------
                                       |
                                      YES
                                       |
         -----------              -----------            -----------
        |Locate and |-YES-|Check for  |--NO-|Renew      |
        |rectify O/C|            |continuity |          |Manual     |
        |at board Y |            |between pin|          |Inching    |
        |connector. |            |24 of board|          |Potentio-  |
        |Refit board|            |Y connector|          |meter (112)|
        |Y.         |            |in lane 1A |          |(120),(128)|
         -----------             |(2A),(3A)  |          |or (136).  |
                                 |or (4A) and|          |Refit board|
                                 |earth, in  |          |Y.         |
                                 |Interface  |           -----------
                                 |Unit (179),|
                                 |(180),(181)|
                                 |or (182).  |
                                  -----------
```

Chart 112 (Sheet 5 of 5)

```
********************************
*A RAMP DOES NOT RISE WHEN THE*
*MANUAL INCHING SWITCH IS SET *
*TO "RAISE" WITH THE MAIN     *
*HYDRAULIC SYSTEM IN USE.     *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 ----------------        ----------------          ----------------
|Set the RAMP -  |      |Check d.c. supply|       |*Renew Manual    |
|SPILL MASTER    |------|at pin X of test |--NO-|Control Panel     |
|switch to "MAN" |      |connector TEST 1A|       |(68).             |
|and the hydraulic|     |(2A),(3A) or (4A)|        ----------------
|selector switch |      |at Interface Unit|
|to "AUTO".      |      |(178),(180),(181)|
 ----------------       |or (182).        |
                         ----------------
                                |
                               YES
                                |
NOTE: All test           ----------------          ----------------
      readings are      |Check d.c. supply|       |Renew Board Y     |
      made with the     |at pin H of test |--NO-|(144),(149),(154)|
      RAMP inching      |connector TEST 1A|       |or (159) in lane  |
      switch held       |(2A),(3A) or (4A)|       |1A,(2A),(3A) or   |
      in the RAISE      |at Interface Unit|       |(4A).             |
      position.         |(179),(180),(181)|        ----------------
                        |or (182).        |               |
                         ----------------
                                |
                               YES
                                |
                       Continued on Sheet 2
```

Chart 113 (Sheet 1 of 2)

Continued from Sheet 1

Remove board Y in lane 1A,(2A),(3A) or (4A) from Interface Unit (179),(180),(181) or (182). Check continuity between pins 25 and 36 on the board.

--NO-- Renew Board Y (144),(149),(154) or (159) in lane 1A, (2A),(3A) or 4A.

YES

Check continuity between pin 25 of board Y connector in the interface unit, lane 1A, (2A),(3A) or (4A) and earth.

-YES- Locate and rectify O/C at board Y connector. Refit board Y.

--NO-- Renew Manual Inching Potentiometer (111),(119),(127) or (135). Refit board Y.

Chart 113 (Sheet 2 of 2)

```
*******************************       ------------------------------
*A SPILL DOOR DOES NOT OPEN   *      |GROUND EQUIPMENT REQUIRED     |
*WHEN THE MANUAL INCHING      *      |------------------------------|
*SWITCH IS SET TO "OPEN" WITH *      |DESCRIPTION           PART NO.|
*THE MAIN HYDRAULIC SYSTEM    *      |------------------------------|
*SELECTED.                    *      |GROUND POWER SUPPLY   -       |
*******************************      |MULTIMETER            -       |
                                      ------------------------------
```

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 ----------------        ------------------       ----------------
|Set the RAMP -  |      |At Spill Door Actu-|     |1. No supply at  |
|SPILL MASTER    |------|ator (81),(82),(83)|-NO-|connectors 1704-A|
|switch to "MAN" |      |or (84) disconnect |     |and 1705-A       |
|and the hydraulic|     |connectors 1K1704- |     |and B - renew    |
|selector to     |      |A,(2K1704-A),      |     |*Manual Control  |
|"AUTO".         |      |(3K1704-A) or      |     |Panel (68).      |
 ----------------       |(4K1704-A),1K1705-A|     |the selector     |
                        |and B, (2K1705-A   |     |valve and unlock |
NOTE: All test          |and B),(3K1705-A   |     |valve connectors |
      readings are      |and B)or (4K1705-A|     |1704-A and 1705B |
      made with the     |and B) from spill  |     |- Sheet 3.       |
      SPILL inching     |door selector      |     |3. No supply at  |
      switch held       |valve, and spill   |     |the spill door   |
      in the OPEN       |door servo and     |     |selector valve   |
      position.         |unlock valves. Hold|     |connector 1704-A |
                        |SPILL inching      |     |Sheet 3.         |
                        |switch at "OPEN"   |     |4. No supply at  |
                        |and check (between |     |the spill door   |
                        |supply and earth)  |     |unlock valve     |
                        |that 28 V d.c.     |     |connector 1705-B)|
                        |supply is present  |     |- Sheet 4.       |
                        |at pin A of spill  |     |5. No supply at  |
                        |door selector and  |     |the spill door   |
                        |spill door unlock  |     |servo valve      |
                        |valves, and d.c.   |     |connector 1705-A |
                        |supply is present  |     |- Sheet 5.       |
                        |between pins A and |      ----------------
                        |B of spill door    |
                        |servo valve        |
                        |connector.         |
                         ------------------
                                  |
```

Continued on Sheet 2

Chart 114 (Sheet 1 of 6)

Continued from Sheet 1

YES

Check for 28 V d.c. between pins A and C of the spill door selector valve connector 1K1704-A, (2K1704-A), (3K1704-A) or (4K1704-A).

--NO-- Locate and rectify O/C between pin C on the spill door selector valve connector and the associated earth point.

YES

Check for 28 V d.c. between pins A and C of the spill door unlock valve connector 1K1705-B, (2K1705-B), (3K1705-B) or (4K1705-B).

--NO-- Locate and rectify O/C between pin C on the spill door unlock valve connector and the associated earth point.

YES

Check continuity of the winding of the Main Selector Valve (85), (87), (89) or (91).

--NO-- Renew Main Selector Valve (85), (87), (89) or (91).

YES

Check continuity of the winding of the Unlock Valve (183), (184), (185) or (186).

-NO- Renew Unlock Valve (183), (184), (185) or (186).

Chart 114 (Sheet 2 of 6)

Continued from Sheet 2

YES

Check continuity of the winding of the Servo Valve (173),(174),(175) or (176).

-YES- Refer to 71-00-42,Trouble Shooting.

NO

Renew Servo Valve (173),(174),(175) or (176).

Continued from Sheet 1. (No supply at the selector valve and unlock valve f connectors 1704-A and 1705-B)

Check for 28 V d.c. at pin U of test connector TEST 1A,(2A),(3A) or (4A) at Interface Unit (179), (180),(181) or f(182).

-YES- Renew Board Y (144),(149),(154) or (159).

NO

Locate and rectify O/C between pin 40 on board X connector and pin 40 on board Y connector in lane 1A,(2A), (3A) or (4A).

Chart 114 (Sheet 3 of 6)

Continued from Sheet 1. (No supply at the spill door selector valve connector 1704-A)

Check for 28 V d.c. at pin K of test connector TEST 1A,(2A),(3A) or (4A) on Interface Unit (179), (180),(181) or (182).

--NO-- *Renew Board Y (144),(149),(154) or (159).

YES

Locate and rectify O/C between pin 9 on board Y connector and pin A on the selector valve connector.

Continued from Sheet 1. (No supply at the spill door unlock valve connector 1705-B).

Check for 28 V d.c. at pin J of test connector TEST 1A,(2A), (3A) or (4A) on Interface Unit (179), (180),(181) or (182).

-YES- Locate and rectify O/C between pin 13 on board Y connector and pin A on the unlock valve connector.

NO

Renew Board Y (144), (149),(154) or (159).

Chart 114 (Sheet 4 of 6)

Continued from Sheet 1. (No supply at the spill door servo valve connector 1705-A)

Check for d.c supply at pin R of test connector TEST 1A,(2A), (3A) or (4A) on Interface Unit (179), (180),(181) or (182).

-YES-

Check for d.c. supply at pin f of test connector TEST 1A,(2A), (3A) or (4A).

--NO-

Locate and rectify O/C in the servo valve connector circuit from board X connector pin 44, via connector 1K1705-A, (2K1705-A), (3K1705-A) or (4K1705-A) back to pin 45 on board X in lane 1A, (2A),(3A) or (4A).

NO (from Check for d.c supply at pin R)

Renew Board X (143), (148),(153) or (158).

YES (from Check for d.c. supply at pin f)

Check for d.c. supply at pin V of test connector TEST 1A,(2A), (3A) or (4A).

--NO-

*Renew Board X (143),(148) (153) or (158).

YES

Continued on Sheet 6

Chart 114 (Sheet 5 of 6)

```
                                                    |
                                         Continued from Sheet 5
                                                    |
 -----------          -----------          -----------          -----------
|*Renew     |        |Check con- |        |Remove     |        |Renew Board|
|Manual     |--NO-   |tinuity    |-YES-   |board Y    |--NO-   |Y (144),   |
|Inching    |        |between pin|        |from Lane  |        |(149),(154)|
|Potentio-  |        |28 at board|        |1A,(2A),   |        |or (159).  |
|meter (116)|        |Y connector|        |(3A) or    |         -----------
|(124),(132)|        |in the Int-|        |(4A). Check|
|or (140).  |        |erface Unit|        |continuity |
|Refit board|        |and earth. |        |between    |
|Y.         |         -----------         |pins 28 and|
 -----------               |              |41 on the  |
                          YES             |board.     |
                           |               -----------
                      -----------
                     |Locate and |
                     |rectify O/C|
                     |at board Y |
                     |connection |
                     |with inter-|
                     |face con-  |
                     |nector.    |
                     |Refit board|
                     |Y.         |
                      -----------
```

Chart 114 (Sheet 6 of 6)

```
*******************************
*A SPILL DOOR DOES NOT SHUT   *
*WHEN THE MANUAL INCHING      *
*SWITCH IS SET TO "SHUT" WITH *
*THE MAIN HYDRAULIC SYSTEM IN *
*USE.                         *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 ----------------          ----------------         ----------------
|Set the RAMP -  |        |Check for 28 V  |       |*Renew Manual   |
|SPILL MASTER    |--------|d.c. at pin V of|--NO-- |Control Panel   |
|switch to "MAN" |        |test connector  |       |(68).           |
|and the hydraulic|       |TEST 1A,(2A),(3A)|       ----------------
|selector switch |        |or (4A) on      |
|to "AUTO". Hold |        |Interface Unit  |
|the SPILL inching|       |(179),(180),(181)|
|switch at the   |        |or (182).       |
|SHUT position.  |         ----------------
 ----------------                 |
                                 YES
                                  |
NOTE: All test             ----------------         ----------------
      readings are        |Check for 28 V  |       |Renew Board Y   |
      made with the       |d.c. at pin K of|--NO-- |(144),(149),(154)|
      SPILL inching       |test connector  |       |or (159).       |
      switch held         |TEST 1A,(2A),(3A)|       ----------------
      at the SHUT         |or (4A) on      |
      position.           |Interface Unit  |
                          |(179),(180),(181)|
                          |or (182).       |
                           ----------------
                                  |
                                 YES
                                  |
```

Continued on Sheet 2

Chart 115 (Sheet 1 of 2)

```
              |
 Continued from Sheet 1
              |
 ----------------                ----------------
|Remove board Y  |        |Renew Board Y    |
|from lane 1A,(2A)|--NO-|(144),(149),(154)|
|(3A) or (4A) from|       |or (159).        |
|Interface Unit   |        ----------------
|(179),(180),(181)|
|or (182). Check  |
|continuity       |
|between pins 29  |
|and 40 on the    |
|board.           |
 ----------------
         |
        YES
         |
 ----------------                ----------------
|Check continuity |       |Renew Manual     |
|between pin 29 at|--NO-|Inching          |
|board Y connector|       |Potentiometer    |
|in the interface |       |(115),(123),(131)|
|unit and earth.  |       |or (139). Refit  |
 ----------------        |board Y.         |
         |                       ----------------
        YES
 ----------------
|Locate and       |
|rectify O/C at   |
|board Y con-     f
|nection with     |
|interface con-   |
|nector. Refit    |
|board Y.         |
 ----------------
```

Chart 115 (Sheet 2 of 2)

"INT" FAILURE CAPTION ILLUMINATED WITH "N1 SIG" FAILURE CAPTION, BOTH LANE-IN-USE LAMPS AND BOTH "LANE" FAILURE CAPTIONS EXTINGUISHED WHEN THE RAMP SPILL MASTER SWITCH IS SET TO AUTO WITH THE LANE SELECTOR SWITCH AT POSITION "A".

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the AICS controls as detailed in 2. Preparation. Set the RAMP - SPILL MASTER switch to "MAN" and the lane selector switch to "A", then reset the RAMP - SPILL MASTER switch to "AUTO".

→ Check for 28 V d.c. at pin C of test connector TEST 1A,(2A), (3A) or (4A) at Interface Unit (179), (180),(181) or (182).

- NO → *Renew Auto Control Panel (67).
- YES → Check continuity between pins P and Z of test connector TEST 1A, (2A),(3A) or (4A) at Interface Unit (179), (180),(181) or (182).
  - NO → Continue trouble shooting at paragraph L.
  - YES → Renew Board X (143), (148),(153) or (158). If fault remains, renew Board Y (144), (149),(154) or (159).

Chart 116

```
********************************       -------------------------------
*INTAKE TEST "ON" CAPTION NOT *       |GROUND EQUIPMENT REQUIRED      |
*ILLUMINATED AND MWS RED "INT"*       |-------------------------------|
*CAPTION NOT ILLUMINATED WHEN *       |DESCRIPTION           PART NO. |
*INTAKE TEST "ON - OFF" SWITCH*       |-------------------------------|
*IS SET TO "ON".              *       |GROUND POWER SUPPLY   -        |
********************************      |MULTIMETER            -        |
                                       -------------------------------

 -----------       -----------        -----------        -----------
|Set the    |     |Check for  |      |Remove the |      |Locate and |
|intake test|-----|28 V d.c.  |-YES-|LH U/C     |--NO-|rectify    |
|ON - OFF   |     |at terminal|      |weight     |      |O/C.       |
|switch to  |     |2 of CB    |      |control    |       -----------
|"ON".      |     |(35).      |      |relay      |
 -----------       -----------       |(200).     |
                        |            |Check for  |
                        NO           |28 V d.c.at|
                        |            |terminal C1|
                   -----------       |of the     |
                  |Renew CB   |      |relay      |
                  |(35).      |      |socket.    |
                   -----------        -----------
                                           |
                                          YES
                                           |
                                      -----------        -----------
                                     |Check for  |      |For further|
                                     |28 V d.c.  |--NO-|trouble    |
                                     |at terminal|      |shooting   |
                                     |X1 of the  |      |refer to   |
                                     |relay      |      |Chapter 32.|
                                     |socket     |       -----------
                                     |(200).     |
                                      -----------
                                           |
                                          YES
                                           |
```

Continued on Page 2

Chart 117 (Sheet 1 of 2)

```
                                   |
                       Continued from Sheet 1
                                   |
     -----------            -----------
    |*Renew Test|          |Connect a  |
    |Panel (50).|--NO-     |link       |
    |Remove link|          |between    |
    |and refit  |          |pins C1 and|
    |relay.     |          |C2 of the  |
     -----------           |relay      |
                           |socket.    |
                           |Check that |
                           |the fault  |
                           |has        |
                           |cleared.   |
                            -----------
                                 |
                                YES
                                 |
                            -----------
                           |*Renew LH  |
                           |U/C Weight |
                           |Switch     |
                           |Control Re-|
                           |lay (200). |
                           |Remove link|
                           |and refit  |
                           |relay.     |
                            -----------
```

Chart 117 (Sheet 2 of 2)

```
*********************************
*"HOLD" CAPTION REMAINS         *
*EXTINGUISHED WITH THE INTAKE   *
*TEST "ON - OFF" SWITCH SET     *
*TO "ON".                       *
*********************************
```

GROUND EQUIPMENT REQUIRED

DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*),check the associated wiring for continuity.

```
 -----------      -----------        -----------        -----------
|Switch on  |    |Remove Air |      |Check for  |      |Renew CB   |
|electrical |----|Intake Test|--NO-|115 V a.c. |--NO-|(29).      |
|ground     |    |Unit (49)  |      |at terminal|       -----------
|power. Set |    |and check  |      |2 of CB    |
|the intake |    |for 115 V  |      |(29).      |
|test ON -  |    |a.c. at pin|       -----------
|OFF switch |    |12 of rack |            |
|to "ON".   |    |connector  |           YES
 -----------     |K1753-A.   |            |
                  -----------        -----------
                       |            |Locate and |
                      YES           |rectify    |
                       |            |O/C.       |
                  -----------        -----------
                 |Renew Air  |
                 |Intake Test|
                 |Unit (49). |
                 |If fault   |
                 |remains,   |
                 |*renew Air |
                 |Intake Test|
                 |Panel (50).|
                  -----------
```

Chart 118

"RP1", "RP2", "RP3", or "RP4"
*CAPTION ILLUMINATED ON AITP *
*WITH LANE 'A' ('B') IN USE. *

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the AICS controls as detailed in 2. Preparation. switch on electrical ground power. Set the intake test ON - OFF switch to "ON" and the CONTINUE - OFF switch to "CONTINUE".	-----	Remove ramp actuator connector Lane A in use 1K1702-A, (2K1702-A), (3K1702-A) or (4K1702-A); Lane B in use 1K1702-E, (2K1702-E), (3K1702-E) or (4K1702-E). Check for 26 V a.c. between pins A and B.	-YES-	f*Renew No.1 intake Ramp Position Resolver, Lane A (169), or Lane B (170).

NO

Continued on Sheet 2

Chart 119 (Sheet 1 of 2)

```
                 |
      Continued from Sheet 1
                 |
          -----------            -----------              -----------
         |Check for   |        |Check for    |          |Locate and |
         |115 V a.c.  |-YES-   |26 V a.c.    |-YES-     |rectify O/C|
         |between     |        |between      |           -----------
         |terminals   |        |terminals    |
         |P1 and P2   |        |S1 and S2    |
         |on trans-   |        |on Trans-    |
         |former:-    |        |former:-     |
         |Lane A      |        |Lane A       |
         |(192),(193) |        |(192),(193)  |
         |(194) or    |        |(194) or     |
         |(195); Lane |        |(195); Lane  |
         |B (196),    |        |B (196),     |
         |(197),(198) |        |(197),(198)  |
         |or (199).   |        |or (199).    |
          -----------            -----------
               |                      |
               NO                     NO
               |                      |
          -----------            ------------
         |Locate and  |        |Renew Trans- |
         |rectify O/C |        |former:-     |
          -----------          |Lane A       |
                               |(192),(193), |
                               |(194) or     |
                               |(195); Lane  |
                               |B (196),     |
                               |(197),(198)  |
                               |or (199).    |
                                ------------
```

Chart 119 (Sheet 2 of 2)

```
********************************
*PRESSURE RATIO ERROR          *
*INDICATOR NOT INDICATING      *
*WITH LANE 'A' IN USE.         *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-
HIGH IMPEDANCE VOLTMETER	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 -----------------        -----------------
|Set the AICS     |      |Set the lane sel-|      Continued on
|controls as      |------|ector switch to  |-----Sheet 2.
|detailed in      |      |position "B".    |
|2. Preparation.  |      |Check that the   |
 -----------------       |fault has cleared|
                          -----------------
                                  |
                                 YES
                                  |
                   -----------------------       -----------------
                  |Set the lane selector  |     |*Renew Air Intake|
                  |switch to position "A".|--NO-|Control Unit     |
                  |Remove board Z (147),  |     |(42),(44),(46) or|
                  |(152),(157) or (162)   |     |(48).            |
                  |from Interface Unit    |      -----------------
                  |(180),(179),(182) or   |
                  |(181) and, using the   |
                  |high impedance         |
                  |voltmeter, check for   |
                  |5 V d.c. between pins  |
                  |54 (+) and 56 (-) of   |
                  |board Z interface      |
                  |fixed connector.       |
                   -----------------------
                              |
                             YES
                              f
                   -----------------------       -----------------
                  |Check for 28 V d.c. at |     |*Renew Board X   |
                  |pin 52 at board Z      |--NO-|(143),(148),(153)|
                  |interface connector.   |     |or (158).        |
                   -----------------------       -----------------
                      Continued on Sheet 2
```

Chart 120 (Sheet 1 of 2)

Continued from Sheet 1

YES

Check for 28 V d.c. at pin 6 of board Z interface conector.

--NO-- Locate and rectify O/C.

YES

Check continuity between pins 54 and 12, and 56 and 14 on board Z.

--NO-- Renew Board Z (147),(152),(157) or (162).

-YES- Locate and rectify O/C at board Z interface connection.

Continued from Sheet 1

Release the Pressure Ratio Indicator Panel (191) Disconnect connector U2745-A, (U2746-A) (U2747-A) or (U2748-A) and check for 5 V d.c. between pins A (+) and J (-) at the free connector.

-YES- Reconnect connector. Using the high impedance voltmeter, check for 5 V d.c. between terminals 2 (-) and 5 (+) at the Pressure Indicator (69), (70),(71) or (72).

-YES- Renew Pressure Ratio Error Indicator (69), (70),(71) or (72).

NO (from Reconnect connector...)

*Renew Potentiometer (187), (188),(189) or (190).

NO (from Release the Pressure Ratio Indicator Panel...)

Locate and rectify O/C between free connector and Interface Unit (180), (179),(182), or (181).

Chart 120 (Sheet 2 of 2)

```
********************************            --------------------------------
*PRESSURE RATIO ERROR          *           |GROUND EQUIPMENT REQUIRED       |
*INDICATOR NOT INDICATING      *           |--------------------------------|
*WITH LANE 'B' IN USE.         *           |DESCRIPTION             PART NO.|
********************************           |================================|
                                           |GROUND POWER SUPPLY       -     |
                                           |MULTIMETER                -     |
                                           |HIGH IMPEDANCE            -     |
                                           |VOLTMETER                       |
                                            --------------------------------
```

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 -----------------          -----------------
|Set the AICS      |       |Set the lane      |      Continue Trouble
|controls as       |-----|selector switch   |--NO-Shooting on Chart
|detailed in       |       |to position "A".  |      120.
|2. Preparation.   |       |Check that the    |
 -----------------         |fault has         |
                           |cleared.          |
                            -----------------
                                    |
                                   YES
                                    |
                       ---------------------         ----------------
                      |Set the lane selector|       |*Renew Air Intake|
                      |switch to position   |--NO-|Control Unit    |
                      |"B".  Remove board Z |       |(42),(44),(46) or|
                      |(147),(152),(157), or|       |(48).            |
                      |(162) from Interface |        ----------------
                      |Unit (180),(179),    |
                      |(182) or (181) and,  |
                      |using the high       |
                      |impedance voltmeter, |
                      |check for 5 V d.c.   |
                      |between pins 8 (+)   |
                      |and 10 (-) of board  |
                      |Z interface fixed    |
                      |connector.           |
                       ---------------------
                                    |
                                   YES
                                    |
```

Continued on Sheet 2

Chart 121 (Sheet 1 of 2)

```
                                              |
                                    Continued from Sheet 1
                                              |
                                    -----------------            -----------------
                                   |Check for 28 V   |          |*Renew Board X    |
                                   |d.c. at pin 42 at|--NO-     |(145),(150),(155) |
                                   |board Z interface|          |or (160).         |
                                   |connector.       |           -----------------
                                    -----------------
                                              |
                                             YES
                                              |
 -----------------                  -----------------            -----------------
|Locate and       |                |Check continuity |          |Renew Board Z     |
|O/C at board Z   |-YES-           |between pins 8   |--NO-     |(147),(152),(157) |
|interface        |                |and 12, and 10   |          |or (162).         |
|connection.      |                |and 14 on board  |           -----------------
 -----------------                 |Z.               |
                                    -----------------
```

Chart 121 (Sheet 2 of 2)

TROUBLE SHOOTING PROCEDURES TO BE TAKEN IF PREVIOUS RECTIFICATION ACTION, I.E., RENEWAL OF COMPONENTS AS INDICATED BY THE AITP, FAILS TO CLEAR THE FAULT.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
TEST SET	TE 6055000
OSCILLATOR (N1 SIMULATOR), 1712 Hz 1 V PEAK-TO-PEAK	-
GROUND POWER SUPPLY	-

Using test loom TE6055201, connect test set connector A to the test socket of the AICU in the lane under test; then, using test set power loom TE6055202, connect a 115 V 400 Hz supply to test set connector B. If N1 signal simulation is required, connect the N1 simulator at the intake under test engine N1 probe connector as follows:- Either probe pins E and J (Lane A N1A, Lane B N1B) or probe pins K and M (Lane A N1B, Lane B N1A). Set the AICS controls as detailed in 2. Preparation Set intake test ON - OFF switch to "ON", the RAMP - SPILL MASTER switches to "AUTO" and the CONTINUE - OFF switch to "CONTINUE".

Read the illuminated numbers on the AITP. Add these numbers together to obtain the pattern number at which the test has failed. This pattern number is used to determine the correct results for the various checks; refer to Table 102 for the results expected at the ACP, to Table 103 for the test sequence number at which the pattern is obtained, to Table 104 for data transmitted by each sensor unit during test and to Table 105 for the automatic tests carried out at each test sequence number.

Continued on Sheet 2

Chart 122 (Sheet 1 of 2)

Continued from Sheet 1

Verify that correct information has been received by control unit as follows:- (a) Read pattern number on AITP. (b) Obtain sequence number(s) at which this pattern occurs from Table 103. (c) Obtain values of alpha Ps and PFC WORD at each sequence corresponding to the failed pattern from Table 104. (d) At the test set, read values of alpha i, Beta i, Psi, Pti, PFC WORD and compare them with the values obtained in (c). Discrepancies in data indicate a failure in Test Unit (49), Sensor Unit (37),(38), (39) or (40), AICU (41),(42),(43), (44),(45),(46),(47),(48) or the wiring between these units.

Chart 122 (Sheet 2 of 2)

```
*******************************
*MWS RED INT CAPTIONS NOT     *
*ILLUMINATED WHEN THE AICS    *
*GROUND - FLIGHT SWITCHES ARE *
*SET TO 'GROUND'.             *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
 ----------------         ----------------         ----------------
|Check for 28 V  |       |At junction box  |       |Refer to Master |
|d.c. at terminal|-YES-  |7-216 remove the |-YES-  |Warning Trouble |
|2 of CB (35).   |       |printed circuit  |       |Shooting,       |
 ----------------        |board from con-  |       |33-15-00.       |
        |                |nector W271-A-5A.|        ----------------
        NO               |Check for 28 V   |
        |                |d.c. at pin 25 of|
 ----------------        |socket           |
|Renew CB (35).  |       |W271-A-5A-B.     |
 ----------------         ----------------
                                 |
                                 NO
                                 |
                          ----------------
                         |Locate and      |
                         |rectify O/C.    |
                          ----------------
```

Chart 123

5. Trouble Shooting-Concorde Air Intake Control System

B Automatic Test Procedure

B This procedure is to be used in conjunction with M.M.71-00-39. If during the automatic test procedure (BITE), the HOLD caption is illuminated, (other than at pattern address no.15) the following procedure should be used.

B Add together the illuminated binary address numbers on the AITP to obtain the pattern address number. Using table 102 in M.M.71-00-39, to determine the expected AIMP display, and in conjunction with the pattern address number, take the appropriate action item 1 and re-test. If this does not clear the defect, take the subsequent action and re-test.

B NOTE: The item numbers quoted in brackets refer to table 101 in MM 71-00-39.

PATTERN ADDRESS		AMP & AITP SYMPTOMS PLUS ACTIONS
1.	Action	Refer to 71-00-39, page 103, Item A.
2.	Symptom	Intake 1 or 2, N1 Reduce lamp not on.
	Action	1) Change CUA for that intake (41 or 43) 2) Change card Z applicable to above CU (147 or 152)
3.	Symptom	Intake 3 or 4, N1 Reduce lamp not on.
	Action	1) Change CUA for that intake (45 or 47) 2) Change card Z applicable to above CU (157 or 162)
4.	Symptom	N1 LRU on at the AITP
	Action	Change probe as indicated (107, 108, 109 or 110)
5.	Symptom	Intake 1 or 2 N1 Reduce lamp not on.
	Action	1) Change CUB for that intake (42 or 44) 2) Change card Z applicable to above CU (147 or 152)
6.	Symptom	Intake 3 or 4 N1 Reduce lamp not on
	Action	1) Change CUB for that intake (46 or

R B 48)
R B 2) Change card Z applicable to above CU (157 or 162).

R B 7. Symptom Intake 2 or 4 HYD and LANE A captions not on Accompanied by Lane A LANE in Use lamp on.

R B Action 1) Change CUA for that intake (43 or 47)
R B 2) Change card Y applicable to above CU (149 or 159).

R B 8. Symptom 1 Intake 1 or 2 INT and LANE B caption not on accompanied by lane B LANE in Use lamp on.

R B Action 1) Change CUB for that intake (42 or 44)
R B 2) Change card Y applicable above CU (146 or 151).

R B Symptom 2 Intake 3 or 4 HYD and LANE A captions not on accompanied by Lane A LANE in Use lamp on.

R B Action 1) Change CUA for that intake (45 or 47)
R B 2) Change card Y applicable to above CU (154 or 159)

R B 9. Symptom INT and 1 or 2 LANE captions not on for one intake accompanied by a LANE in Use lamp on.

R B Action 1) Change CU which is in use (41, 42, 43, 44, 45, 46, 47 or 48).
R B 2) Change card Y applicable to above CU (144, 146, 149, 151, 154, 156, 159 or 161)

R B 10. Symptom Intake 1 or 3 HYD and LANE A captions on plus lane B LANE in Use lamp on, or Intake 2 or 4 LANE A caption on plus lane B LANE in Use lamp on.

R B Action 1) Change CUA for that intake (41, 43, 45 or 47)
R B 2) Refer to 71-00-41, page 106, Item A and 71-00-42, page 106, Item A.

11. Symptom: Intake 1 or 3 INT, LANE B and HYD caption on or Intake 2 or 4 INT and LANE B caption on.

Action:
1) Change CUB for that intake (42, 44, 46 or 48)
2) Refer to 71-00-41, page 106, Item A and 71-00-42, Page 106, Item A.

12. The system is unlikely to HOLD here if no previous HOLDS have occurred.

13. Sympton: INT and 1 or 2 LANE captions not on for one intake plus a LANE in Use lamp on.

Action:
1) Change CU which is in use (41, 42, 43, 44, 45, 46, 47 or 48)
2) Change card X applicable to above CU (143, 145, 148, 150, 153, 155, 158 or 160)
3) Change Lane not in use time delay relay applicable to above CU (mounted on A11Us 179, 180, 180, 179, 181, 182, 182 or 181 respectively)

14. Symptom: INT and 1 or 2 LANE captions not on for any intake accompanied by a LANE in Use lamp on.

Action:
1) Change CU which is in use (41, 42, 43, 44, 45, 46, 47 or 48)
2) Change Card X applicable to above CU (143, 145, 148, 150, 153, 155, 158 or 160).

15. The system is designed to HOLD here. If not change AITU (49).

16. Symptom: Intake 1 or 2 HYD and LANE A caption no on accompanied by lane A LANE in Use lamp on.

Action:
1) Change CUA for that intake. (41 or 43)
2) Change card Y applicable to above CU (144 or 149)

17. Symptom: Intake 1 or 3 HYD and LANE A captions not on accompanied by Lane A LANE in

B Use lamp on.

B Action 1) Change CUA for that intake (41 or
B 45)
B 2) Change card Y applicable to above
B CU (144 or 154)

B 18. Symptom Intake 2 or 4 HYD and LANE A captions
B on plus lane B LANE in Use lamp on,
B or Intake 1 or 3 LANE A caption on
B plus lane B LANE in Use lamp on.

B Action 1) Change CUA for that intake (41,
B 43, 45 or 47)
B 2) Refer to 71-00-41, page 106, Item
B A and 71-00-42, page 106, Item A.

B 19. Symptom Intake 2 or 4 INT, Lane B and HYD
B captions on or Intake 1 or 3 INT, and
B LANE B captions on.

B Action 1) Change CUB for that intake (42,
B 44, 46 or 48)
B 2) Refer to 71-00-41, page 106, Item
B A and 71-00-42, page 106, Item A.

B 20. Symptom Intake 1 or 3 INT and LANE B captions
R B not on accompanied by lane B LANE in
B Use lamp on.

B Action 1) Change CUB for that intake (42 or
B 46)
B 2) Change card Z applicable to above
B CU (147 or 157)
B 3) Refer to 71-00-42, page 106, Item
B A.

B 21. Symptom Intake 2 or 4 INT and LANE B captions
B not on accompanied by lane B LANE in
B Use lamp on.

B Action 1) Change CUB for that intake (44 or
B 48)
B 2) Change card Z applicable to above
B CU (152 or 162)
B 3) Refer to 71-00-42, page 106, Item
B A.

B 22. Symptom 1) SU3 and CU5 LRUs on at the AITP

B Action Change CU4 (44)

B		Symptom	2) SU3 and CU4 LRUs on at the AITP
B		Action	Change CU5 (45)
B	23.	Symptom	1) SU4 andCU7 LRUs on at the AITP
B		Action	Change CU2 (42)
B		Symptom	2) SU4 and CU2 LRUs on at the AITP
B		Action	Change CU7 (47)
B	24.	Symptom	1) SU3 and CU5 LRUs on at the AITP
B		Action	Change CU4 (44)
B		Symptom	2) SU3 and CU4 LRUs on at the AITP
B		Action	Change CU5 (45)
B B B B	25.	Symptom	1) Intake 2 INT and LANE B captions no on accompanied by lane B LANE in Use lamp on. Plus SU3 and CU5 LRUs on at the AITP
B		Action	Change CU4 (44)
B B B B		Symptom	2) Intake 3 LANE A caption not on accompanied by lane A LANE in Use lamp on. Plus SU3 and CU4 LRUs on at the AITP.
B		Action	Change CU5 (45)
B	27.	Symptom	1) SU1 and CU8 LRUs on at the AITP
B		Action	Change CU1 (41)
B		Symptom	2) SU1 and CU1 LRUs on at the AITP
B		Action	Change CU8 (48)
R B B B	28.	Symptom	1) SU1 and CU8 LRU's on at the AITP. ALPHA caption may not be on at the AIMP
B		Action	Change CU1 (41)
B		Symptom	2) SU1 and CU1 LRUs on at the AITP
B		Action	Change CU8 (48)

B. 29.	Symptom	1) Intake 1 LANE A caption not on accompanied by Lane A LANE In Use lamp on. Plus SU1 and CU8 LRUs on at the AITP.	B B B
B	Action	Change CU1 (41)	
B	Symptom	2) Intake 4 LANE B caption not on. Plus SU1 and CU1 LRUs on at the AITP.	B B
B	Action	Change CU8 (48)	
B 30.	Symptom	1) Intake 1 INT and LANE B captions not on accompanied by Lane B LANE In Use lamp on. Plus SU4 and CU7 LRUs on at the AITP.	B B B
B	Action	Change CU2 (42)	
B	Symptom	2) Intake 4 LANE A caption not on accompanied by Lane A LANE In Use lamp on. Plus SU4 and CU2 LRUs on at the AITP.	B B B
B	Action	Change CU7 (47)	
B 32.	Symptom	1) SU2 and CU6 LRUs on at the AITP.	
B	Action	Change CU3 (43)	
B	Symptom	2) SU2 and CU3 LRUs on at the AITP	
B	Action	Change CU6 (46)	
B 33.	Symptom	1) Intake 2 LANE A caption not on accompanied by lane A LANE In Use lamp on. Plus SU2 and CU6 LRU on at the AITP.	B R B B
B	Action	Change CU3 (43)	
B	Symptom	2) Intake 3 LANE B caption not on. Plus SU2 and CU3 on at the AITP.	B
B	Action	Change CU6 (45)	
B 34.	Symptom	1) SU2 and CU6 LRUs on at the AITP	
B	Action	Change CU3 (43)	

B		Symptom	2) SU2 and CU3 LRUs on at the AITP
B		Action	Change CU6 (46)
B	35.	Symptom	1) SU4 and CU7 LRUs on at the AITP
B		Action	Change CU2 (42)
B		Symptom	2) SU4 and CU2 LRUs on at the AITP
B		Action	Change CU7 (47)
B	37.	Symptom	A CU on at the AITP, may be accompanied by corresponding INT and LANE captions not on and LANE IN USE lamp on.
B		Action	Change CU as indicated (41, 42, 43, 44, 45, 46, 47 or 48)
B	38.	Symptom	A CU LRU on at the AITP
B		Action	Change CU as indicated (41, 42, 43, 44, 45, 46, 47 or 48).
B	40.	Symptom	1) N1 Sig and LANE A captions not on for one intake accompanied by Lane A LANE IN USE lamp on. Plus N1 and lane B CU LRUs, for that intake, on at the AITP.
R B		Action	1) Change CUA for that intake (41, 43, 45 or 47) 2) Change card X applicable to above CU (143, 148, 153 or 158).
B		Symptom	2) N1 and lane A CU LRUs, for one intake, on at the AITP.
B		Action	1) Change CUB for that intake (42, 44, 46 or 48) 2) Change card X applicable to above CU (145, 150, 155 or 160).
B	41.	Symptom	1) N1 Sig and LANE A captions not on for one intake accompanied by lane A LANE IN USE lamp on. Plus N1 and lane B CU LRUs, for that intake, on at the AITP.
B		Action	1) Change CUA for that intake (41,

R B 43, 45 or 47)
R B 2) Change card X applicable to above
R B CU (143, 148, 153 or 158)

R B Symptom 2) N1 and lane A CU LRUs, for one in-
R B take, on at the AITP

R B Action 1) Change CUB for that intake (42,
R B 44, 46 or 48)
R B 2) Change card X applicable to above
R B CU (145, 150, 155 or 160)

R B 42. Symptom 1) N1 Sig and LANE A captions not on
R B for one intake accompanied by lane
R B A LANE IN USE lamp on. Plus N1
R B and lane B CU LRUs, for that in-
R B take, on at the AITP.

R B Action 1) Change CUA for that intake (41,
R B 43, 45 or 47)
R B 2) Change card X applicable to above
R B CU (143, 148, 153 or 158)

R B Symptom 2) N1 and lane A CU LRUs for one in-
R B take on at the AITP

R B Action 1) Change CUB for that intake (42,
R B 44, 46 or 48)
R B 2) Change card X applicable to above
R B CU (145, 150, 155 or 160)

R B 43. Symptom 1) INT and LANE B captions not on for
R B one intake accompanied by lane B
R B LANE IN USE lamp on. Plus CUB LRU
R B for that intake on at the AITP, or
R B N1 LRU for one intake on at the
R B AITP.

R B Action 1) Change CUB for that intake (42,
R B 44, 46 or 48)
R B 2) Change card X applicable to above
R B CU (145, 150, 155 or 160).

R B Symptom 2) N1 Sig caption not on for one in-
R B take. Plus N1 LRU for that intake
R B on at the AITP or CUA LRU for one
R B intake on at the AITP.

R B Action 1) Change CUA for that intake (41,
R B 43, 45 or 47)
R B 2) Change card X applicable to above

R B CU (143, 148, 153 or 158)

R B 44. Symptom CU LRU on for one intake at the AITP

R B Action Change CU as indicated (41, 42, 43,
R B 44, 45, 46, 47 or 48)

R B 45. Symptom PV LRU on for one lane at the AITP

R B Action 1) Change associated CU (41, 42, 43,
R B 44, 45, 46, 47 or 48)
R B 2) Change PV sensors as indicated (51
R B & 52, 53 & 54, 55 & 56, 57 & 58,
R B 59 & 60, 61 & 62, 63 & 64, or 65
R B & 66)

R B 46. Action Press continue and action next HOLD

R B 47. Symptom CU LRU on for one intake at the AITP

R B Action Change CU as indicated (41, 42, 43,
R B 44, 45, 46, 47 or 48)

R B 48. Sympton 1) CU 1 or CU 5 LRU on at the AITP

R B Action Change CU 1 or 5 as indicated (41 or
R B 45)

R B Symptom 2) Intake 2 or 4 INT and LANE B
R B captions not on accompanied by
R B Lane B LANE IN USE lamp on. Plus
R B CU 4 or 8 LRU on at the AITP.

R B Action 1) Change CU 4 or 8 as indicated (44
R B or 48)
R B 2) Change card X applicable to above
R B CU (150 or 160)

R B 49. Symptom 1) CU3 or 7 LRU on at the AITP

R B Action Change CU 3 or 7 as indicated (43
R B 47)

R B Symptom 2) Intake 1 or 3 INT and LANE B
R B captions not on accompanied by
R B lane B LANE IN USE lamp on, plus
R B CU 2 or 6 LRU on at the AITP.

R B Action 1) Change CU 2 or 6 as indicated (47
R B or 46).
R B 2) Change card X applicable to above

R B CU (145 or 155).

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(1) Circuit breaker	-	1-213	1K1950	Map ref.D9	24-50-00 R/I	71-60-03
(2) Circuit breaker	-	1-213	2K1960	Map ref.E9	24-50-00 R/I	71-60-03
(3) Circuit breaker	-	1-213	4E531	Map ref.F9	24-50-00 R/I	71-60-03
(4) Circuit breaker	-	1-213	3E531	Map ref.G9	24-50-00 R/I	71-60-03
(5) Circuit breaker	-	1-213	1K1976	Map ref.H9	24-50-00 R/I	71-60-03
(6) Circuit breaker	-	2-213	1K2052	Map ref.A14	24-50-00 R/I	71-60-03
(7) Circuit breaker	-	2-213	4K2051	Map ref.B14	24-50-00 R/I	71-60-03
(8) Circuit breaker	-	2-213	2K1900	Map ref.C14	24-50-00 R/I	71-60-21
(9) Circuit breaker	-	2-213	1K2050	Map ref.D14	24-50-00 R/I	71-60-03
(10) Circuit breaker	-	2-213	1E541	Map ref.E14	24-50-00 R/I	71-63-02
(11) Circuit breaker	-	2-213	4E541	Map ref.F14	24-50-00 R/I	71-63-02
(12) Circuit breaker	-	2-213	2K2051	Map ref.H14	24-50-00 R/I	71-60-03
(13) Circuit breaker	-	2-213	3K2050	Map ref.H13	24-50-00 R/I	71-60-03
(14) Circuit breaker	-	2-213	3K2052	Map ref.G14	24-50-00 R/I	71-60-03
(15) Circuit	-	4-213	2E541	Map ref.E17	24-50-00	71-63-02

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
breaker					R/I	
(16) Circuit breaker	-	4-213	3E541	Map ref.F17	24-50-00 R/I	71-63-02
(17) Circuit breaker	-	4-213	1K1900	Map ref.G17	24-50-00 R/I	71-60-21
(18) Circuit breaker	-	5-213	4K1960	Map ref.A6	24-50-00 R/I	71-60-03
(19) Circuit breaker	-	5-213	3K1950	Map ref.A7	24-50-00 R/I	71-60-03
(20) Circuit breaker	-	5-213	1E531	Map ref.C6	24-50-00 R/I	71-60-03
(21) Circuit breaker	-	5-213	2E531	Map ref.C7	24-50-00 R/I	71-60-03
(22) Circuit breaker	-	5-213	3K1976	Map ref.D6	24-50-00 R/I	71-60-03
(23) Circuit breaker	-	13-216	2K2050	Map ref.A3	24-50-00 R/I	71-60-03
(24) Circuit breaker	-	13-216	3K2051	Map ref.B3	24-50-00 R/I	71-60-03
(25) Circuit breaker	-	13-216	2K2052	Map ref.B4	24-50-00 R/I	71-60-03
(26) Circuit breaker	-	15-215	2K1950	Map ref.B18	24-50-00 R/I	71-60-03
(27) Circuit breaker	-	15-215	3K1960	Map ref.C18	24-50-00 R/I	71-60-03
(28) Circuit breaker	-	15-215	2K1976	Map ref.D18	24-50-00 R/I	71-60-03
(29) Circuit breaker	-	13-216	K1754	Map ref.A4	24-50-00 R/I	71-60-03
(30) Circuit	-	14-216	1K2051	Map ref.A5	24-50-00	71-60-03

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
breaker					R/I	
(31) Circuit breaker	-	14-216	4K2050	Map ref.B5	24-50-00 R/I	71-60-03
(32) Circuit breaker	-	14-216	4K2052	Map ref.C5	24-50-00 R/I	71-60-03
(33) Circuit breaker	-	15-216	4K1950	Map ref.A8	24-50-00 R/I	71-60-03
(34) Circuit breaker	-	15-216	1K1960	Map ref.B8	24-50-00 R/I	71-60-03
(35) Circuit breaker	-	15-216	K1755	Map ref.C8	24-50-00 R/I	71-60-03
(36) Circuit breaker	-	15-216	4K1976	Map ref.D8	24-50-00 R/I	71-60-03
(37) No.1 air intake sensor unit (No.1 AISU)	-	10-215	1K1801	Flight compartment LH racking	71-61-11 R/I	71-60-01
(38) No.2 air intake sensor unit (No.2 AISU)	-	10-215	2K1801	Flight compartment LH racking	71-61-11 R/I	71-60-01
(39) No.3 air intake sensor unit (No.3 AISU)	-	10-216	3K1801	Flight compartment RH racking	71-61-11 R/I	71-60-01
(40) No.4 air intake sensor unit	-	10-216	4K1801	Flight compartment RH racking	71-61-11 R/I	71-60-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(No.4 AISU)						
(41) No.1 air intake control unit (No.1A AICU)	-	5-243	1K2001	LH rear racking	71-61-21 R/I	71-61-02
(42) No.2 air intake control unit (No.1B AICU)	-	4-243	1K2002	LH rear racking	71-61-21 R/I	71-61-02
(43) No.3 air intake control unit (No.2A AICU)	-	4-243	2K2001	LH rear racking	71-61-21 R/I	71-61-02
(44) No.4 air intake control unit (No.2B AICU)	-	5-243	2K2002	LH rear racking	71-61-21 R/I	71-61-02
(45) No.5 air intake control unit (No.3A AICU)	-	4-244	3K2001	RH rear racking	71-61-21 R/I	71-61-02
(46) No.6 air intake control unit (No.3B AICU)	-	5-244	3K2002	RH rear racking	71-61-21 R/I	71-61-02

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(47) No.7 air intake control unit (No.4A AICU)	-	5-244	4K2001	RH rear racking	71-61-21 R/I	71-61-02
(48) No.8 air intake control unit (No.4B AICU)	-	4-244	4K2002	RH rear racking	71-61-21 R/I	71-61-02
(49) Air intake test unit (AITU)	-	9-216	K1753	Flight compartment RH racking	71-61-18 R/I	71-60-01
(50) Air intake test panel (AITP)	-	8-214	K1752	3CM station	71-61-15 R/I	71-60-01
(51) Absolute pressure sensor (lane A control)	-	411	1K2201	No.1 intake roof	71-61-43 R/I	71-60-05
(52) Absolute pressure sensor (lane A monitor)	-	411	1K2200	No.1 intake roof	71-61-43 R/I	71-60-05
(53) Absolute pressure sensor (lane B control)	-	411	1K2204	No.1 intake roof	71-61-43 R/I	71-60-03
(54) Absolute pressure sensor (lane B monitor)	-	411	1K2203	No.1 intake roof	71-61-43 R/I	71-60-05

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(55) Absolute pressure sensor (lane A control)	-	421	2K2201	No.2 intake roof	71-61-43 R/I	71-60-05
(56) Adbsolute pressure sensor (lane A monitor)	-	421	2K2200	No.2 intake roof	71-61-43 R/I	71-60-05
(57) Absolute pressure sensor (lane B control)	-	421	2K2204	No.2 intake roof	71-61-43 R/I	71-60-05
(58) Absolute pressure sensor (lane B monitor)	-	421	2K2203	No.2 intake roof	71-61-43 R/I	71-60-05
(59) Absolute pressure sensor (lane A control)	-	431	3K2201	No.3 intake roof	71-61-43 R/I	71-60-05
(60) Absolute pressure sensor (lane A control)	-	431	3K2200	No.3 intake roof	71-61-43 R/I	71-60-05
(61) Absolute pressure sensor (lane B control)	-	431	3K2204	No.3 intake roof	71-61-43 R/I	71-60-05
(62) Absolute pressure sensor	-	431	3K2203	No.3 intake roof	71-61-43 R/I	71-60-05

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(lane B monitor)						
(63) Absolute pressure sensor (lane A control)	-	441	4K2201	No.4 intake roof	71-61-43 R/I	71-60-05
(64) Absolute pressure sensor (lane A monitor)	-	441	4K2200	No.4 intake roof	71-61-43 R/I	71-60-05
(65) Absolute pressure sensor (lane B control)	-	441	4K2204	No.4 intake roof	71-61-43 R/I	71-60-05
(66) Absolute pressure sensor (lane B monitor)	-	441	4K2203	No.4 intake roof	71-61-43 R/I	71-60-05
(67) Auto control panel (ACP)	-	8-214	K2035	3CM station	71-61-16 R/I	71-61-02
(68) Manual control panel (MCP)	-	8-214	K2030	3CM station	71-61-22 R/I	71-63-02
(69) No.1 intake pressure ratio error indicator	-	35-214	1E569	Intake status panel	71-61-26 R/I	71-60-61
(70) No.2 intake pressure	-	35-214	2E569	Intake status panel	71-61-26 R/I	71-60-61

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
ratio error indicator						
(71) No.3 intake pressure ratio error indicator	-	35-214	3E569	Intake status panel	71-61-26 R/I	71-60-62
(72) No.4 intake pressure ratio error indicator	-	35-214	4E569	Intake status panel	71-61-26 R/I	71-60-62
(73) Servo valve spill door actuator	-	411	-	No.1 spill door actuator	71-64-11 R/I	71-64-01
(74) Servo valve spill door actuator	-	421	-	No.2 spill door actuator	71-64-11 R/I	71-64-01
(75) Servo valve spill door actuator	-	431	-	No.3 spill door actuator	71-64-11 R/I	71-64-01
(76) Servo valve spill door actuator	-	441	-	No.4 spill door actuator	71-64-11 R/I	71-64-01
(77) No.1 intake ramp actuator	-	411	1K1702	No.1 intake roof	71-63-11 R/I	71-63-01
(78) No.2 intake	-	421	2K1702	No.2 intake roof	71-63-11 R/I	71-63-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ramp actuator						
(79) No.3 intake ramp actuator	-	431	3K1702	No.3 intake roof	71-63-11 R/I	71-63-01
(80) No.4 intake ramp actuator	-	441	4K1702	No.4 intake roof	71-63-11 R/I	71-63-01
(81) No.1 intake spill door actuator	411 HL	411	1K1705	No.1 intake sidewall	71-64-11 R/I	71-64-01
(82) No.2 intake spill door actuator	421 HR	421	2K1705	No.2 intake sidewall	71-64-11 R/I	71-64-01
(83) No.3 intake spill door actuator	431 HL	431	3K1705	No.3 intake sidewall	71-64-11 R/I	71-64-01
(84) No.4 intake spill door actuator	441 HR	441	4K1705	No.4 intake sidewall	71-64-11 R/I	71-64-01
(85) No.1 intake spill door actuator selector valve (main)	411 JL	411	1K1704	No.1 intake sidewall	71-62-12 R/I	71-64-01
(86) No.1 intake spill door actuator	411 JL	411	1K1703	No.1 intake sidewall	71-62-12 R/I	71-64-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
selector valve (standby)						
(87) No.2 intake spill door actuator selector valve (main)	421 JR	421	2K1704	No.2 intake sidewall	71-62-12 R/I	71-64-01
(88) No.2 intake spill door actuator selector valve (standby)	421 JR	421	2K1703	No.2 intake sidewall	71-62-12 R/I	71-64-01
(89) No.3 intake spill door actuator selector valve (main)	431 JL	431	3K1704	No.3 intake sidewall	71-62-12 R/I	71-64-01
(90) No.3 intake spill door actuator selector valve (standby)	431 JL	431	3K1703	No.3 intake sidewall	71-62-12 R/I	71-64-01
(91) No.4 intake spill door actuator selector valve (main)	431 JR	431	4K1704	No.4 intake sidewall	71-62-12 R/I	71-64-01
(92) No.4	441 JR	441	4K1703	No.4 intake	71-62-12	71-64-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
intake spill door actuator selector valve (standby)				sidewall	R/I	
(93) No.1 intake spill door position resolver chassis	411 HL	411	1K1700	No.1 intake sidewall	71-64-13 R/I	71-64-01
(94) No.2 intake spill door position resolver chassis	421 HR	421	2K1700	No.2 intake sidewall	71-64-13 R/I	71-64-01
(95) No.3 intake spill door position resolver chassis	431 HL	431	3K1700	No.3 intake sidewall	71-64-13 R/I	71-64-01
(96) No.4 intake spill door position resolver chassis	441 HR	441	4K1700	No.4 intake sidewall	71-64-13 R/I	71-64-01
(97) Servo valve ramp actuator (standby)	-	411	1K1702	No.1 ramp actuator	71-63-11 R/I	71-63-01
(98) Servo valve ramp actuator	-	421	2K1702	No.2 ramp actuator	71-63-11 R/I	71-63-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(standby)						
(99) Servo valve ramp actuator (standby)	-	431	3K1702	No.3 ramp actuator	71-63-11 R/I	71-63-01
(100) Servo valve ramp actuator (standby)	-	441	4K1702	No.4 ramp actuator	71-63-11 R/I	71-63-01
(101) Selector valve ramp actuator (standby)	-	411	1K1702	No.1 ramp actuator	71-63-11 R/I	71-63-01
(102) Selector valve ramp actuator (standby)	-	421	2K1702	No.2 ramp actuator	71-63-11 R/I	71-63-01
(103) Selector valve ramp actuator (standby)	-	431	3K1702	No.3 ramp actuator	71-63-11 R/I	71-63-01
(104) Selector valve ramp actuator (standby)	-	441	4K1702	No.4 ramp actuator	71-63-11 R/I	71-63-01
(105) No.1 angle of incidence sensor	-	113	1F91	Droop nose shell, LH	34-11-31 R/I	71-60-21
(106) No.2 angle of	-	114	2F91	Droop nose shell, LH	34-11-31 R/I	71-60-21

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
incidence sensor						
(107)No.1 engine rpm probe	-	415	E153	No.1 engine gearbox	76-12-01 R/I	71-60-05
(108)No.2 engine rpm probe	-	426	E153	No.2 engine gearbox	76-12-01 R/I	71-60-05
(109)No.3 engine rpm probe	-	435	E153	No.3 engine gearbox	76-12-01 R/I	71-60-05
(110)No.4 engine rpm probe	-	446	E153	No.4 engine gearbox	76-12-01 R/I	71-60-05
(111)No.1A inch rate adjust RAMP-RAISE potent-iometer	-	5-243	-	No.1 inter-face unit	71-61-00 R/I	71-63-01
(112)No.1A inch rate adjust RAMP-LOWER potent-iometer	-	5-243	-	No.1 inter-face unit	71-61-00 R/I	71-63-01
(113)No.1B inch rate adjust RAMP-RAISE potent-iometer	-	4-243	-	No.2 inter-face unit	71-61-00 R/I	71-63-01
(114)No.1B inch rate	-	4-243	-	No.2 inter-face unit	71-61-00 R/I	71-63-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
adjust RAMP-LOWER potent-iometer						
(115)No.1A inch rate adjust SPILL-SHUT potent-iometer	-	5-243	-	No.1 inter-face unit	71-61-00 R/I	71-64-01
(116)No.1A inch rate adjust SPILL-OPEN potent-iometer	-	5-243	-	No.1 inter-face unit	71-61-00 R/I	71-64-01
(117)No.1B inch rate adjust SPILL-OPEN potent-iometer	-	4-243	-	No.2 inter-face unit	71-61-00 R/I	71-64-01
(118)No.1B inch rate adjust SPILL-OPEN potent-iometer	-	4-243	-	No.2 inter-face unit	71-61-00 R/I	71-64-01
(119)No.2A inch rate adjust RAMP-RAISE potent-iometer	-	4-243	-	No.2 inter-face unit	71-61-00 R/I	71-63-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(120)No.2A inch rate adjust RAMP-LOWER potent-iometer	-	4-243	-	No.2 inter-face unit	71-61-00 R/I	71-63-01
(121)No.2B inch rate adjust RAMP-RAISE potent-iometer	-	5-243	-	No.1 inter-face unit	71-61-00 R/I	71-63-01
(122)No.2B inch rate adjust RAMP-LOWER potent-iometer	-	5-243	-	No.1 inter-face unit	71-61-00 R/I	71-63-01
(123)No.2 inch rate adjust SPILL-SHUT potent-iometer	-	4-243	-	No.2 inter-face unit	71-61-00 R/I	71-64-01
(124)No.2A inch rate adjust SPILL-OPEN potent-iometer	-	4-243	-	No.2 inter-face unit	71-61-00 R/I	71-64-01
(125)No.2B inch rate adjust SPILL-SHUT	-	5-243	-	No.1 inter-face unit	71-61-00 R/I	71-64-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
potent-iometer						
(126)No.2B inch rate adjust SPILL-SHUT potent-iometer	-	5-243	-	No.1 inter-face unit	71-61-00 R/I	71-64-01
(127)No.3A inch rate adjust RAMP-RAISE potent-iometer	-	4-244	-	No.3 inter-face unit	71-61-00 R/I	71-63-01
(128)No.3A inch rate adjust RAMP-LOWER potent-iometer	-	4-244	-	No.3 inter-face unit	71-61-00 R/I	71-63-01
(129)No.3B inch rate adjust RAMP-RAISE potent-iometer	-	5-244	-	No.4 inter-face unit	71-61-00 R/I	71-63-01
(130)No.3B inch rate adjust RAMP-LOWER potent-iometer	-	5-344	-	No.4 inter-face unit	71-61-00 R/I	71-63-01
(131)No.3A inch rate	-	4-244	-	No.3 inter-face unit	71-61-00 R/I	71-64-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
adjust SPILL-SHUT potent-iometer						
(132)No.3A inch rate adjust SPILL-OPEN potent-iometer	-	4-244	-	No.3 inter-face unit	71-61-00 R/I	71-64-01
(133)No.3B inch rate adjust SPILL-SHUT potent-iometer	-	5-244	-	No.4 inter-face unit	71-61-00 R/I	71-64-01
(134)No.3B inch rate adjust SPILL-OPEN potent-iometer	-	5-244	-	No.4 inter-face unit	71-61-00 R/I	71-64-01
(135)No.4A inch rate adjust RAMP-RAISE potent-iometer	-	5-244	-	No.4 inter-face unit	71-61-00 R/I	71-63-01
(136)No.4A inch rate adjust RAMP-LOWER potent-iometer	-	5-244	-	No.4 inter-face unit	71-61-00 R/I	71-63-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(137)No.4B inch rate adjust RAMP-RAISE potent-iometer	-	4-244	-	No.3 inter-face unit	71-61-00 R/I	71-63-01
(138)No.4B inch rate adjust RAMP-LOWER potent-iometer	-	4-244	-	No.3 inter-face unit	71-61-00 R/I	71-63-01
(139)No.4A inch rate adjust SPILL-SHUT potent-iometer	-	5-244	-	No.4 inter-face unit	71-61-00 R/I	71-64-01
(140)No.4A inch rate adjust SPILL-OPEN potent-iometer	-	5-244	-	No.4 inter-face unit	71-61-00 R/I	71-64-01
(141)No.4B inch rate adjust SPILL-SHUT potent-iometer	-	4-244	-	No.3 inter-face unit	71-61-00 R/I	71-64-01
(142)No.4B inch rate adjust SPILL-OPEN	-	4-244	-	No.3 inter-face unit	71-61-00 R/I	71-64-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
potent- iometer						
(143)Board X, lane 1A No.1 intake	-	5-243	-	No.1 inter- face unit	71-61-23 R/I	71-61-02
(144)Board Y, lane 1A No.1 intake	-	5-243	-	No.1 inter- face unit	71-61-23 R/I	71-62-01
(145)Board X, lane 1B No.1 intake	-	4-243	-	No.2 inter- face unit	71-61-23 R/I	71-61-02
(146)Board Y, lane 1B No.1 intake	-	4-243	-	No.2 inter- face unit	71-61-23 R/I	71-62-01
(147)Board Z, No.1 intake	-	4-243	-	No.2 inter- face unit	71-61-23 R/I	71-61-02
(148)Board X, lane 2A No.2 intake	-	4-243	-	No.2 inter- face unit	71-61-23 R/I	71-61-02
(149)Board Y, lane 2A No.2 intake		4-243	-	No.2 inter- face unit	71-61-23 R/I	71-62-01
(150)Board X, lane 2B No.2 intake	-	5-243	-	No.1 inter- face unit	71-61-23 R/I	71-61-02
(151)Board Y, lane 2B No.2	-	5-243	-	No.1 inter- face unit	71-61-23 R/I	71-62-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
intake						
(152)Board Z, No.2 intake	-	5-243	-	No.1 inter-face unit	71-61-23	71-61-02
(153)Board X, Lane 3A No.3 intake	-	4-244	-	No.3 inter-face unit	71-61-23 R/I	71-61-02
(154)Board Y, Lane 3A No.3 intake	-	4-244	-	No.3 inter-face unit	71-61-23 R/I	71-62-01
(155)Board X, Lane 3B No.3 intake	-	5-244	-	No.4 inter-face unit	71-61-23 R/I	71-61-02
(156)Board Y, Lane 3B No.3 intake	-	5-244	-	No.4 inter-face unit	71-61-23 R/I	71-62-01
(157)Board Z, No.3 intake	-	5-244	-	No.4 inter-face unit	71-61-23 R/I	71-61-02
(158)Board X, Lane 4A No.4 intake	-	5-244	-	No.4 inter-face unit	71-61-23 R/I	71-61-02
(159)Board Y, Lane 4A No.4 intake	-	5-244	-	No.4 inter-face unit	71-61-23 R/I	71-62-01
(160)Board X, Lane 4B No.4 intake	-	4-244	-	No.3 inter-face unit	71-61-23 R/I	71-61-02

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(161)Board Y, lane 4B No.4 intake	-	4-244	-	No.3 inter-face unit	71-61-23 R/I	71-62-01
(162)Board Z, No.4 intake	-	4-244	-	No.3 inter-face unit	71-61-23 R/I	71-61-02
(163)Main (green) hydraulic low level switch	-	153	D47	Green hydraulic reservoir	29-11-61 R/I	71-62-01
(164)Main (blue) hydraulic low level switch	-	154	D49	Blue hydraulic reservoir	29-12-61 R/I	71-62-01
(165)Standby (yellow) hydraulic low level switch	-	154	D48	Yellow hydraulic reservoir	29-21-61 R/I	71-62-01
(166)Main (green) hydraulic low pressure switch	-	152	K2180	Green hydraulic manifold	71-62-31 R/I	71-62-01
(167)Main (blue) hydraulic low pressure switch	-	152	K2183	Blue hydraulic manifold	71-62-31 R/I	71-62-01
(168)Standby (yellow) low pressure	-	152	K2177	Yellow hydraulic manifold	71-62-31 R/I	71-62-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
switch						
(169) Ramp position resolver unit (lane 1A)	-	411	-	No.1 ramp actuator	71-63-11 R/I	71-63-01
(170) Ramp position resolver unit (lane 1B)	-	411	-	No.1 ramp actuator	71-63-11 R/I	71-63-01
(171) Ramp position resolver unit (lane 2A)	-	421	-	No.2 ramp actuator	71-63-11 R/I	71-63-01
(172) Ramp position resolver unit (lane 2B)	-	421	-	No.2 ramp actuator	71-63-11 R/I	71-63-01
(173) Ramp position resolver unit (lane 3A)	-	431	-	No.3 ramp actuator	71-63-11 R/I	71-63-01
(174) Ramp position resolver unit (lane 3B)	-	431	-	No.3 ramp actuator	71-63-11 R/I	71-63-01
(175) Ramp position resolver unit (lane 4A)	-	441	-	No.4 ramp actuator	71-63-11 R/I	71-63-01
(176) Ramp	-	441	-	No.4 ramp	71-63-11	71-63-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
position resolver unit (lane 4B)				actuator	R/I	
(177)Diode board	-	7-243	K2337	LH rear racking	-	71-62-01
(178)Diode board	-	7-244	K2338	RH rear racking	-	71-62-01
(179)No.1 interface unit	-	5-243	K2031	LH rear racking	25-71-00	71-61-02
(180)No.2 interface unit	-	4-243	K2032	LH rear racking	25-71-00	71-61-02
(181)No.3 interface unit	-	4-244	K2033	RH rear racking	25-71-00	71-61-02
(182)No.4 interface unit	-	5-244	K2034	RH rear racking	25-71-00	71-61-02
(183)Selector valve (unlock) spill door actuator	-	411	-	No.1 spill door actuator	71-64-11 R/I	71-64-01
(184)Selector valve (unlock) spill door actuator	-	421	-	No.2 spill door actuator	71-64-11 R/I	71-64-01
(185)Selector valve (unlock) spill	-	431	-	No.3 spill door actuator	71-64-11 R/I	71-64-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
door actuator						
(186) Selector valve (unlock) spill door actuator	-	441	-	No.4 spill door actuator	71-64-11 R/I	71-64-01
(187) Potent-iometer pressure ratio error indicator	-	35-214	1E570	Intake status panel	71-61-26 R/I	71-60-61
(188) Potent-iometer pressure ratio error indicator	-	35-214	2E570	Intake status panel	71-61-26 R/I	71-60-61
(189) Potent-iometer pressure ratio error indicator	-	35-214	3E570	Intake status panel	71-61-26 R/I	71-60-62
(190) Potent-iometer pressure ratio error indicator	-	35-214	4E570	Intake status panel	71-61-26 R/I	71-60-62
(191) Intake status panel (pressure ratio error indicator	-	35-214	-	3CM station	71-61-26 R/I	71-60-61

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
panel)						
(192)Transformer	-	7-243	1K1708	LH rear racking	71-61-00 R/I	71-60-03
(193)Transformer	-	7-243	2K1708	LH rear racking	71-61-00 R/I	71-60-03
(194)Transformer	-	7-244	3K1708	RH rear racking	71-61-00 R/I	71-60-03
(195)Transformer	-	7-244	4K1708	RH rear racking	71-61-00 R/I	71-60-03
(196)Transformer	-	7-243	1K1709	LH rear racking	71-61-00 R/I	71-60-03
(197)Transformer	-	7-243	2K1709	LH rear racking	71-61-00 R/I	71-60-03
(198)Transformer	-	7-244	3K1709	RH rear racking	71-61-00 R/I	71-60-03
(199)Transformer	-	7-244	4K1709	RH rear racking	71-61-00 R/I	71-60-03
(200) LH L/C weight switch control relay	-	2-123	G306	LH hydraulic relay box	32-61-00 R/I	71-60-01
(201)Servo valve ramp actuator (main)	-	411	1K1702	No.1 ramp actuator	71-63-11 R/I	71-63-01
(202)Servo valve ramp actuator (main)	-	421	2K1702	No.2 ramp actuator	71-63-11 R/I	71-63-01
(203)Servo	-	431	3K1702	No.3 ramp	71-63-11	71-63-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
valve ramp actuator (main)				actuator	R/I	
(204)Servo valve ramp actuator (main)	-	441	4K1702	No.4 ramp actuator	71-63-11 R/I	71-63-01
(205)Selector valve ramp actuator (main)	-	411	1K1702	No.1 ramp actuator	71-63-11 R/I	71-63-01
(206)Selector valve ramp actuator (main)	-	421	2K1702	No.2 ramp actuator	71-63-11 R/I	71-63-01
(207)Selector valve ramp actuator (main)	-	431	3K1702	No.3 ramp actuator	71-63-11 R/I	71-63-01
(208)Selector valve ramp actuator (main)	-	441	4K1702	No.4 ramp actuator	71-63-11 R/I	71-63-01

After SB 71-001 For A/C 001-003,

(209)Ground - Flight Switch	-	14-214	K1757	Ram air turbine panel	71-61-00 R/I	71-60-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(210)Ground - Flight Switch	-	14-214	K1758	Ram air turbine panel	71-61-00 R/I	71-60-01
(211)Ground - Flight Switch	-	14-214	K1759	Ram air turbine panel	71-61-00 R/I	71-60-01
(212)Ground - Flight Switch	-	14-214	K1760	Ram air turbine panel	71-61-00 R/I	71-60-01

Component Identification
Table 101

CAPTION:	ALP-HA	N1 SIG	INT	LANE-IN-USE	LANE	HYD	N1 REDUCE
INTAKE:	ALL	1234	1234	11223344	11223344	1234	1234
LANE:				ABABABAB	ABABABAB		
PATTERN NO.							
01	-	----	----	*-*-*-*-	--------	----	----
02	-	----	----	*-*-*-*-	--------	----	**--
03	-	----	----	*-*-*-*-	--------	----	--**
04	-	****	----	-*-*-*-*	*-*-*-*-	----	----
05	-	****	----	-*-*-*-*	*-*-*-*-	----	**--
06	-	****	----	-*-*-*-*	*-*-*-*-	----	--**
07	-	----	----	*--**--*	--*---*-	-*-*	----
08	-	----	**--	-----*-*	*****-*-	****	----
09	-	----	****	--------	********	****	----
10	-	----	----	*-*-*-*-	--------	-*-*	----
11	-	****	----	-*-*-*-*	*-*-*-*-	-*-*	----
12	-	****	****	--------	********	----	----
13	-	----	****	--------	********	----	----
14	*	----	****	--------	********	----	----
15	"NONSENSE PATTERN" to ensure that the AITU can produce a FAIL at beginning of sequence.						
16	-	----	----	-*-**-*-	*-*-----	**--	----
17	-	----	----	-**--**-	*---*---	*-*-	----
18	-	----	----	*-*-*-*-	--------	*-*-	----
19	-	****	----	-*-*-*-*	*-*-*-*-	*-*-	----
20	-	****	****	--------	********	*-*-	----
21	-	****	****	--------	********	-*-*	----
22	*	----	****	--------	********	----	----
23	*	----	****	--------	********	----	----
24	-	----	****	--------	********	----	----
25	-	----	-*--	-*---**-	*-***---	----	----
26	-	----	----	--------	--------	----	----
27	-	----	****	--------	********	----	----
28	*	----	****	--------	********	----	----
29	-	----	----	-**-*-*-	*------*	----	----
30	-	----	**--	-----*-*	*****-*-	----	----
31	-	----	----	--------	--------	----	----
32	-	----	****	--------	********	----	----
33	-	----	----	-*-**-*-	*-*-*---	----	----
34	*	----	****	--------	********	----	----
35	-	----	****	--------	********	----	----
36	-	----	----	--------	--------	----	----
37	-	----	****	--------	********	----	----
38	-	----	----	*-*-*-*-	--------	----	----
39	-	----	----	--------	--------	----	----
40	-	****	----	-*-*-*-*	*-*-*-*-	*-*-	----
41	-	****	----	-*-*-*-*	*-*-*-*-	----	----
42	-	****	----	-*-*-*-*	*-*-*-*-	-*-*	----

CAPTION:	ALP-HA	N1 SIG	INT	LANE-IN-USE	LANE	HYD	N1 REDUCE
INTAKE:	ALL	1234	1234	11223344	11223344	1234	1234
LANE:				ABABABAB	ABABABAB		
PATTERN NO.							
43	-	****	****	--------	********	----	----
44	-	****	****	--------	********	----	----
45	-	----	****	--------	********	----	----
46	-	****	****	--------	********	----	----
47	-	****	****	--------	********	----	----
48	-	****	-*-*	-*---*--	*-***-**	*-*-	----
49	-	****	*-*-	---*---*	***-***-	-*-*	----

AITP Pattern Number with Expected ACP and N1 Reduce
Display (Illuminated captions shown thus *)
Table 102

PATTERN NUMBER	TEST SEQUENCE NUMBERS	PATTERN NUMBER	TEST SEQUENCE NUMBERS
1	9,23 40,44,48,52,56, 59,88,96,106,116,120, 125,129,165,177,202,227, 232,236,242,250,252,254.	26	-
		27	77
2	91	28	137,150
3	94	29	62
4	240	30	71
5	104	31	-
6	101	32	80
7	205	33	65
8	112	34	140,153
9	114,118	35	86
10	207,209,211	36	-
11	215,217,219	37	28,30,32,34,36,74,131
12	17	38	26
13	42,46,50,54,123,127,134 148,161,173	39	-
14	163;170	40	188
15	6	41	98,238
16	109	42	213
17	180	43	11
18	182,184,186	44	13
19	190,192,194	45	38
20	199	46	19,21
21	224	47	15

PATTERN NUMBER	TEST SEQUENCE NUMBERS	PATTERN NUMBER	TEST SEQUENCE NUMBERS
22	143,156	48	196
23	146,159	49	221
24	83	50	-
25	68		

Pattern Numbers and Associated Test Sequence Numbers
Table 103

DATA TRANSMITTED BY SENSOR UNITS (NB. During automatic test Pt is 2587 BITS and BETA is 2048 BITS)

SEQ NO.	PAT NO.	SU1(AICUs 1&8) ALPA BITS	SU1 Ps BITS	SU1 PFC WORD BITS	SU2(AICUs 3&6) ALPA BITS	SU2 Ps BITS	SU2 PFC WORD BITS	SU3(AICUs 4&5) ALPA BITS	SU3 Ps BITS	SU3 PFC WORD BITS	SU4(AICUs 2&7) ALPA BITS	SU4 Ps BITS	SU4 PFC WORD BITS
0-4	-	2085	2560	0608	2085	2560	0608	2085	2560	0608	2085	2560	0608
6	15	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
9	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
11	43	2085	2560	0992	2085	2560	0992	2085	2560	0992	2085	2560	0992
13	44	2085	2560	1001	2085	2560	1001	2085	2560	1001	2085	2560	1001
15	47	2085	2560	1022	2085	2560	1022	2085	2560	1022	2085	2560	1022
17	12	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
19	46	2085	2560	1600	2085	2560	1600	2085	2560	1600	2085	2560	1600
21	46	2085	2560	1568	2085	2560	1568	2085	2560	1568	2085	2560	1568
23	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
26	38	2085	2560	1659	2085	2560	1659	2085	2560	1659	2085	2560	1659
28	37	2085	2560	1647	2085	2560	1647	2085	2560	1647	2085	2560	1647
30	37	2085	2560	1646	2085	2560	1646	2085	2560	1646	2085	2560	1646
32	37	2085	2560	1641	2085	2560	1641	2085	2560	1641	2085	2560	1641
34	37	2085	2560	1662	2085	2560	1662	2085	2560	1662	2085	2560	1662
36	37	2085	2560	1660	2085	2560	1660	2085	2560	1660	2085	2560	1660
38	45	2085	2560	1661	2085	2560	1661	2085	2560	1661	2085	2560	1661
40	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
42	13	2085	2560	1645	2085	2560	1645	2085	2560	1645	2085	2560	1645
44	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
46	13	2085	2560	1644	2085	2560	1644	2085	2560	1644	2085	2560	1644
48	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656

DATA TRANSMITTED BY SENSOR UNITS (NB. During automatic test Pt is 2587 BITS and BETA is 2048 BITS)

SEQ NO.	PAT NO.	SU1(AICUs 1&8) ALPA BITS	SU1 Ps BITS	SU1 PFC WORD BITS	SU2(AICUs 3&6) ALPA BITS	SU2 Ps BITS	SU2 PFC WORD BITS	SU3(AICUs 4&5) ALPA BITS	SU3 Ps BITS	SU3 PFC WORD BITS	SU4(AICUs 2&7) ALPA BITS	SU4 Ps BITS	SU4 PFC WORD BITS
50	13	2085	2560	1656	2085	2560	1656	2085	2560	1656	2085	2560	1656
52	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
54	13	2085	2560	1655	2085	2560	1655	2085	2560	1655	2085	2560	1655
56	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
59	1	1669	2560	2656	1669	2560	2656	2085	2560	2656	2085	2560	2656
62	29	2085	1364	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
65	33	2085	2560	2656	2085	1364	2656	2085	2560	2656	2085	2560	2656
68	25	2085	2560	2656	2085	2560	2656	2085	1364	2656	2085	2560	2656
71	30	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	1364	2656
74	37	2085	2560	1647	2085	2560	1647	2085	2560	1647	2085	2560	1647
77	27	2085	2560	2656	2085	1364	2656	2085	1364	2656	2085	1364	2656
80	32	2085	1364	2656	2085	2560	2656	2085	1364	2656	2085	1364	2656
83	24	2085	1364	2656	2085	1364	2656	2085	2560	2656	2085	1364	2656
86	35	2085	1364	2656	2085	1364	2656	2085	1364	2656	2085	2560	2656
88	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
91	2	2085	2560	2912	2085	2560	2912	2085	2560	2656	2085	2560	2656
94	3	2085	2560	2656	2085	2560	2656	2085	2560	2912	2085	2560	2912
96	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
98	41	2085	2560	2016	2085	2560	2016	2085	2560	2016	2085	2560	2016
101	6	2085	2560	2912	2085	2560	2912	2085	2560	2656	2085	2560	2656
104	5	2085	2560	2656	2085	2560	2656	2085	2560	2912	2085	2560	2912
106	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656

DATA TRANSMITTED BY SENSOR UNITS (NB. During automatic test Pt is 2587 BITS and BETA is 2048 BITS)

SEQ NO.	PAT NO.	SU1(AICUs 1&8) ALPA BITS	SU1 Ps BITS	SU1 PFC WORD BITS	SU2(AICUs 3&6) ALPA BITS	SU2 Ps BITS	SU2 PFC WORD BITS	SU3(AICUs 4&5) ALPA BITS	SU3 Ps BITS	SU3 PFC WORD BITS	SU4(AICUs 2&7) ALPA BITS	SU4 Ps BITS	SU4 PFC WORD BITS
109	16	2085	2560	1642	2085	2560	1642	2085	2560	2656	2085	2560	2656
112	8	2085	2560	2656	2085	2560	2656	2085	2560	1642	2085	2560	1642
114	9	2085	2560	1642	2085	2560	1642	2085	2560	1642	2085	2560	1642
116	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
118	9	2085	2560	1663	2085	2560	1663	2085	2560	1663	2085	2560	1663
120	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
123	13	2085	2560	0096	2085	2560	0096	2085	2560	0096	2085	2560	0096
125	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
127	13	2085	2560	0352	2085	2560	0352	2085	2560	0352	2085	2560	0352
129	1	2085	2560	2656	2085	2560	2656	2085	2560	2656	2085	2560	2656
131	37	2085	2560	0608	2085	2560	0608	2085	2560	0608	2085	2560	0608
134	13	2085	1000	2656	2085	1000	2656	2085	1000	2656	2085	1000	2656
137	28	1669	1000	2656	2085	1000	2656	2085	1000	2656	2085	1000	2656
140	34	2085	1000	2656	1669	1000	2656	2085	1000	2656	2085	1000	2656
143	22	2085	1000	2656	2085	1000	2656	1669	1000	2656	2085	1000	2656
146	23	2085	1000	2656	2085	1000	2656	2085	1000	2656	1669	1000	2656
148	13	1669	1000	2656	1669	1000	2656	1669	1000	2656	1669	1000	2656
150	28	2085	1000	2656	1669	1000	2656	1669	1000	2656	1669	1000	2656
153	34	1669	1000	2656	2085	1000	2656	1669	1000	2656	1669	1000	2656
156	22	1669	1000	2656	1669	1000	2656	2085	1000	2656	1669	1000	2656
159	23	1669	1000	2656	1669	1000	2656	1669	1000	2656	2085	1000	2656
161	13	2085	1000	2656	2085	1000	2656	2085	1000	2656	2085	1000	2656

DATA TRANSMITTED BY SENSOR UNITS (NB. During automatic test Pt is 2587 BITS and BETA is 2048 BITS)

SEQ NO.	PAT NO.	SU1(AICUs 1&8)			SU2(AICUs 3&6)			SU3(AICUs 4&5)			SU4(AICUs 2&7)		
		ALPA BITS	Ps BITS	PFC WORD BITS	ALPA BITS	Ps BITS	PFC WORD BITS	ALPA BITS	Ps BITS	PFC WORD BITS	ALPA BITS	Ps BITS	PFC WORD BITS
163	14	1669	1000	2656	1669	1000	2656	2085	1000	2656	2085	1000	2656
165	1	2085	1000	2656	2085	1000	2656	2085	1000	2656	2085	1000	2656
170	14	1669	1000	0864	1669	1000	0864	2085	1000	0864	2085	1000	0864
173	13	2085	1000	2656	2085	1000	2656	2085	1000	2656	2085	1000	2656
177	1	2085	1905	2656	2085	1905	2656	2085	1905	2656	2085	1905	2656
180	17	2085	1905	1642	2085	1905	2656	2085	1905	1642	2085	1905	2656
182	18	2085	1905	2656	2085	1905	2656	2085	1905	2656	2085	1905	2656
184	18	2085	1800	2656	2085	1800	2656	2085	1800	2656	2085	1800	2656
186	18	2085	1905	2656	2085	1905	2656	2085	1905	2656	2085	2905	2656
188	40	2085	1905	2016	2085	1905	2016	2085	1905	2016	2085	1905	2016
190	19	2085	1905	2656	2085	1905	2656	2085	1905	2656	2085	1905	2656
192	19	2085	1800	2656	2085	1800	2656	2085	1800	2656	2085	1800	2656
194	19	2085	1905	2656	2085	1905	2656	2085	1905	2656	2085	1905	2656
196	48	2085	1905	1647	2085	1905	2656	2085	1905	1647	2085	1905	2656
199	20	2085	1800	1120	2085	1800	1120	2085	1800	1120	2085	1800	1120
202	1	2085	1905	2656	2085	1905	2656	2085	1905	2656	2085	1905	2656
205	7	2085	1905	2656	2085	1905	1642	2085	1905	2656	2085	1905	1642
207	10	2085	1905	2656	2085	1905	2656	2085	1905	2656	2085	1905	2656
209	10	2085	1800	2656	2085	1800	2656	2085	1800	2656	2085	1800	2656
211	10	2085	1905	2656	2085	1905	2656	2085	1905	2656	2085	1905	2656
213	42	2085	1905	2016	2085	1905	2016	2085	1905	2016	2085	1905	2016
215	11	2085	1905	2656	2085	1905	2656	2085	1905	2656	2085	1905	2656

DATA TRANSMITTED BY SENSOR UNITS (NB. During automatic test Pt is 2587 BITS and BETA is 2048 BITS)													
SEQ NO.	PAT NO.	SU1(AICUs 1&8)			SU2(AICUs 3&6)			SU3(AICUs 4&5)			SU4(AICUs 2&7)		
		ALPA BITS	Ps BITS	PFC WORD BITS	ALPA BITS	Ps BITS	PFC WORD BITS	ALPA BITS	Ps BITS	PFC WORD BITS	ALPA BITS	Ps BITS	PFC WORD BITS
217	11	2085	1800	2656	2085	1800	2656	2085	1800	2656	2085	1800	2656
219	11	2085	1905	2656	2085	1905	2656	2085	1905	2656	2085	1905	2656
221	49	2085	1905	2656	2085	1905	1647	2085	1905	2656	2085	1905	1647
224	21	2085	1800	1120	2085	1800	1120	2085	1800	1120	2085	1800	1120
227	1	2085	1905	2656	2085	1905	2656	2085	1905	2656	2085	1905	2656
231	-	2085	2560	3808	2085	2560	3808	2085	2560	3808	2085	2560	3808

At this point the "N1 REQD" caption is illuminated if the engines are not running. The following steps are only carried out if all engines are running.

232	1	2085	2560	3808	2085	2560	3808	2805	2560	3808	2085	2560	3808
236	1	2085	2560	4064	2085	2560	4064	2805	2560	4064	2085	2560	4064
238	41	2085	2560	2016	2085	2560	2016	2805	2560	2016	2085	2560	2016
240	4	2085	2560	4064	2085	2560	4064	2805	2560	4064	2085	2560	4064
242	1	2085	2560	3808	2085	2560	3808	2805	2560	3808	2085	2560	3808

The following steps check that the automatic test has been de-selected. Ps 1364 is transmitted to each sensor unit but it must not be transmitted by the sensor units to the control units. During these steps all control units should receive normal values of Ps, Pt, alpha and beta, i.e., not the values transmitted by the test Unit.

250	1	2085	1364	3808	2085	2560	3808	2085	2560	3808	2085	2560	3808
252	1	2085	1364	3808	2085	1364	3808	2085	2560	3808	2085	2560	3808
254	1	2085	1364	3808	2085	1364	3808	2085	1364	3808	2085	1364	3808

Data Transmitted by Sensor Units During Automatic Test Procedure
Table 104

SEQUENCE NO.	DESCRIPTION OF TEST
0-6	Transmit M = 0 to all SU's, with 'A' fails, to inhibit any 'Y' fails.
9	Clear and reset.
11	Monitors A + F failed.
13	Monitors A + F + N failed.
15	Monitors A + F + T failed.
17	Clear (no resets).
19	Comp. check (+15 V) monitors F to W failed.
21	Comp. check (-15 V) monitors F to W failed.
23	Clear and reset.
26	Monitor W failed (LRU check only).
28	Monitor H failed.
30	Monitor I failed.
32	Monitor N failed.
34	Monitor T failed.
36	Monitor V failed.
38	Monitor U failed.
40	Clear and reset.
42	Monitor J failed.
44	Clear and reset.
46	Monitor K failed.
48	Clear and reset.
50	Monitor P failed.

SEQUENCE NO.	DESCRIPTION OF TEST
52	Clear and reset.
54	Monitor Q failed.
56	Clear and reset.
59	Transmit alpha 2 to SU1 and 2; alpha fail inhibition M less than 1.2.
60	Clear alpha fail.
62	Transmit M = 1 to SU1; B fail CU1 and 8.
63	Transmit M = 0 to SU1.
65	Transmit M = 1 to SU2; B fail CU3 and 6.
66	Transmit M = 0 to SU2.
68	Transmit M = 1 to SU3; B fail CU4 and 5.
69	Transmit M = 0 to SU3.
71	Transmit M = 1 to SU4; B fail CU2 and 7.
72	Transmit M = 0 to SU4.
74	Transmit H fail to all CU's.
75	Clear.
77	Transmit M = 1 to SU2, 3, and 4; B fail CU1 and 8.
78	Transmit M = 1 to SU1.
80	Transmit M = 0 to SU2; B fail CU3 and 6.
81	Transmit M = 1 to SU2.
83	Transmit M = 0 to SU3; B fail CU4 and 5.
84	Transmit M = 1 to SU3.
86	Transmit M = 0 to SU4; B fail CU2 and 7.
88	Transmit M = 0 to SU1, 2 and 3; clear and reset.

SEQUENCE NO.	DESCRIPTION OF TEST
91	N1 reduce check; intakes 1 and 2, lane A.
92	Clear.
94	N1 reduce check; intakes 3 and 4, lane A.
96	Clear.
98	N1 SIG, fail all CU's.
99	Clear.
101	N1 reduce, check; intakes 3 and 4, lane B.
102	Clear.
104	N1 reduce, check; intakes 1 and 2, lane B.
106	Clear and reset.
109	Transmit M fail to SU1 and 2; Auto hyd. and lane change intakes 1 and 2.
110	Transmit clear to SU1 and 2.
112	Transmit M fail to SU3 and 4; Auto hyd. and lane change intakes 3 and 4, lane B fail intakes 1 and 2.
114	Transmit M fail to SU1 and 2, lane B fail intakes 3 and 4.
116	Clear and reset.
118	Transmit S fail to all CUs; "HYD", "LANE" and "INT" captions illuminated all intakes.
120	Clear and reset.
123	Subsonic monitor checks.
125	Clear and reset.
127	Lane-in-use relay checks.
129	Clear and reset.

SEQUENCE NO.	DESCRIPTION OF TEST
131	Transmit watchdog counter fail (Mon A) to all CU's, to inhibit Y fails.
132	Transmit M = 1.24 to all SU's.
134	Clear (no resets).
137	Transmit alpha 2 to SU1; C fail CU1 and 8.
138	Transmit alpha 1 to SU1.
140	Transmit alpha 2 to SU2; C fail CU3 and 6.
141	Transmit alpha 1 to SU2.
143	Transmit alpha 2 to SU3; C fail CU4 and 5.
144	Transmit alpha 1 to SU3.
146	Transmit alpha 2 to SU4; C fail CU2 and 7.
148	Transmit alpha 2 to SU1, 2 and 3; remove C fails.
150	Transmit alpha 1 to SU1; C fail CU1 and 8.
151	Transmit alpha 2 to SU1.
153	Transmit alpha 1 to SU2; C fail CU 3 and 6.
154	Transmit alpha 2 to SU2.
156	Transmit alpha 1 to SU3; C fail CU4 and 5.
157	Transmit alpha 2 to SU3.
159	Transmit alpha 1 to SU4; C fail CU2 and 7.
161	Transmit alpha 1 to SU1, 2 and 3; remove C fails.
163	Transmit alpha 2 to SU1 and 2; C fails all CU's.
165	Transmit alpha 1 to SU1 and 2; Clear and lane resets, ramps move.
166	Transmit Y fails to all CU's.

SEQUENCE NO.	DESCRIPTION OF TEST
170	Transmit alpha 2 to SU1 and 2 to clear Y fails.
171	Clear (no resets).
173	Transmit alpha 1 to SU1 and 2; remove C fails.
174 and 175	Transmit M = 0.675 and A fails to all CU's,
177	Clear and lane reset. Ramps move up.
180	Transmit M fails to SU1 and 3; auto hyd. and lane change intakes 1 and 3.
182	Transmit clear to SU1 and SU3; lane reset.
184	Transmit M = 0.725 to all CU's, surfaces move, lane A, intakes 1 and 3 standby, 2 and 4 main hyd.
186	Transmit M = 0.675 to all CU's, surfaces move, lane A, intakes 1 and 3 standby, 2 and 4 main hyd.
188	Transmit N1 SIG fails; auto lane change all intakes.
190	Transmit clear.
192	Transmit M = 0.725 to all CU's; surfaces move, lane B, intakes 1 and 3 standby, 2 and 4 main hyd.
194	Transmit M = 0.675 to all CU's; surfaces move, lane B, intakes 1 and 3 standby, 2 and 4 main hyd.
196	Transmit H fails to SU1 and 3; "INT" fail intakes 2 and 4.
197	Transmit lock test instruction.
199	Transmit M = 0.725 to all CU's; "INT" fail intakes 1 and 3.
200	Transmit M = 0.675 to all CU's.
202	Clear and reset.
205	Transmit M fails to SU2 and 4; auto lane and hyd. change intakes 2 and 4.

SEQUENCE NO.	DESCRIPTION OF TEST
207	Transmit clear to SU2 and 4; lane reset.
209	Transmit M = 0.725 to all CU's; surfaces move lane A, intakes 2 and 4 standby, 1 and 3 main hyd.
211	Transmit M = 0.675 to all CU's; surfaces move, lane A, intakes 2 and 4 standby, 1 and 3 main hyd.
213	Transmit N1 SIG fails; auto lane change all intakes.
215	Transmit clear.
217	Transmit M = 0.725 to all CU's; surfaces move, lane B, intakes 2 and 4 standby, 1 and 3 main hyd.
219	Transmit M = 0.675 to all CU's; surfaces move, lane B, intakes 2 and 4 standby, 1 and 3 main hyd.
221	Transmit H fails to SU2 and 4; "INT" fail intakes 1 and 3.
222	Transmit lock test instruction.
224	Transmit M = 0.725 to all CU's; "INT" fail intakes 2 and 4.
225	Transmit M = 0.675 to all CU's.
227	Clear and reset.
231 and 232	Transmit M = 0 to all CU's.
236	Transmit instruction to short circuit N1A. No N1 fails.
238	Transmit instruction to short circuit N1A and N1B. N1 fails auto lane changeover all intakes.
240	Transmit instruction to short circuit N1B. No. N1 fails in AICU's.
242	Clear and reset.
248	Deselect automatic test.

SEQUENCE NO.	DESCRIPTION OF TEST
250	Transmit ps3 to SU1. Check no failures.
252	Transmit ps3 to SU2. Check no failures.
254	Transmit ps3 to SU3 and 4. Check no failures.

Sequence of Automatic Test
Table 105

E_1	$= A + B + H + I + N + T + U + V + Y + Z + (J + K + P + Q)$. Lane-in-use.	Lane Fail
E_2	$= F$	N_1 Fail
E_3	$= C$	Fail
E_4	$= D$	Fail
E_5	$= M.\ \bar{E}_1.$ Lane-in-use	Ramp Fail
E_6	$= S.\ \bar{\bar{E}}_1.$ Lane-in-use	Spill Fail

Logic Equations of Failures Output to Interface Unit
Table 106

L_1	$= C$	Fail
L_2	$= D$	Fail
L_3	$= B$	Mach Fail
L_4	$= F$	N_1 Fail
L_5	$= A.N$	Ramp Resolvers fail
L_6	$= U$	Pv fail
L_7	$= A.T.$	Spill Resolver fail
L_8	$= (K + M.\bar{J})$ .Lane-in-use	Ramp Actuator fail
L_9	$= (Q + S.\bar{P})$. Lane-in-use	Spill Actuator fail
L_{10}	$= A.\ (\overline{N + T}) + \bar{A}.\ (N + T) + H + I + J.\bar{K} + P.\bar{Q} + V + W + Y + Z$	Control Unit Fail

Test Highway Logic Equations
Table 107

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	MONITOR	TRIGGERING LEVEL		SK25	OTHER DETAILS
No.	DEFINITION	± % F.S.	VOLTS	P/N NO.	
A	Processor Electronics			71	See para (d)
B	Mach X-monitor	5 ± 1.5	0.33 ± 0.10	42	
		7.6 ± 1.5	0.49 ± 0.10		when α failed
C	α X-monitor	6 ± 1.5	0.39 ± 0.10	90	when M > 1.2
D	β X-monitor	6.1 ± 1.5	0.40 ± 0.10	54	Not applicable
F	N1 out of limits			11	9.3 ± 1.3% > N1 > 125.5 ± 8%
H	Ramp Demand	8 ± 1	0.80 ± 0.10	30	
I	Spill Demand	8 ± 1	0.80 ± 0.10	41	
J	Ramp Electronics	56.5 ± 6	2.82 ± 0.30	4	
K	Ramp Coil			19	)
M	Ramp Actuator			8	)See Analogue
N	Ramp Resolver Pick-off			44	)Signal)Monitoring
P	Spill Electronics	24.7 ± 3	1.24 ± 0.15	27	
Q	Spill Coil			51	)
S	Spill Actuator			18	)See Analogue
T	Spill Resolver Pick-off			45	)Signal)Monitoring
U	Pv	3.7 ± 1	0.37 ± 0.10	60	
V	Δ N1	20 ± 5	1.40 ± 0.35	70	

Control Unit Monitoring
Table 108
(Continued)

	MONITOR	TRIGGERING LEVEL		SK25	OTHER DETAILS
No.	DEFINITION	± % F.S.	VOLTS	P/N NO.	
W	P α	20 ± 5	1.40 ± 0.35	5	
Y	Processor Feedback Check			46	
Z	Spare			33	
				49	Digital Ground

Control Unit Monitoring
Table 108
(Concluded)

MONITOR FAILURE	INTERPRETATION OF FAILURE
A	Comparison of data by processor indicates errors. Could be due to failure of AICU or external signal sources. If any of monitors B, F, N, T or U are also failed then the signal associated with these monitors is possibly the cause. If monitor 'A' is failed without the above monitors the Z Highway display can be used to determine the reason for failure as described later. If failed with Monitor Z only, check the AICU 115V supply.
B	Mach X-monitor failure. The Mach inputs from other AICU's are different from the Mach No. generated by this AICU from its Control Highway data. Examine Mach X-monitor voltage using DVM (SELECTOR A at position 1) at each AICU to determine source of problem, e.g. AICU's 1 and 8 may both have different voltages from other units, indicating failure of Sensor Unit No.1.
C	Incidence X-monitor failure. Follow similar procedure as for B fail.
F	Engine speed N1 signal missing or outside frequency limits.
H	Ramp demand fault. Comparison of duplicated analogue demand circuits. Internal AICU failure.
I	Spill demand fault. Comparison of duplicated analogue demand circuits. Internal AICU failure.
J	Ramp Servo Valve drive electronics fault. Internal AICU failure.

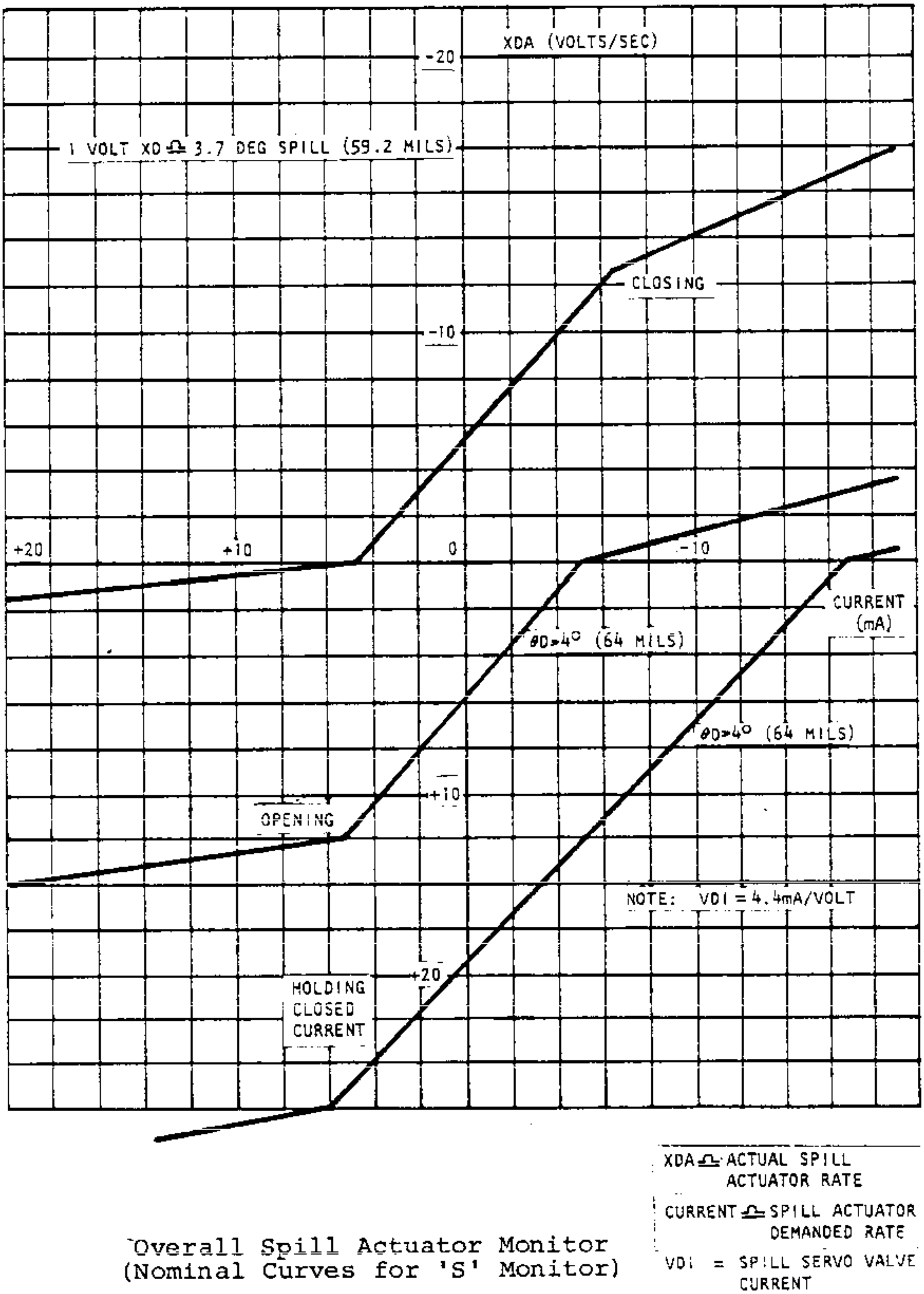
Monitor Failures

Table 109 (continues)

MONITOR FAILURE	INTERPRETATION OF FAILURE
K	Ramp Servo Valve coil resistance incorrect. Always failed when lane out of use because connections to AICU are open circuited by interface unit relays.
M	Ramp Actuator not achieving demanded position. Check hydraulic pressures.
N	Ramp Resolvers do not compare or have lost their 26V reference.
P	Spill Servo Valve drive electronics fault. Internal AICU failure.
Q	Spill Servo Valve resistance incorrect. Similar to monitor K.
S	Spill Actuator. Similar to monitor M.
T	Spill Resolvers. Similar to monitor N.
U	Pv sensor signals do not agree.
V	$N_{1/\sqrt{\theta}}$ circuit (modulator) failure. Internal AICU fault.
W	P α circuit (modulator) failure. Internal AICU fault.
Y	Processor Feedback failure. Usually caused by a step change in data from one of the input circuits. Can be cleared by cycling the AICU supply C/B unless an AICU failure is the cause.
Z	Spare monitor but useful because it illuminates with Monitor A when the 115V supply is missing from the AICU.

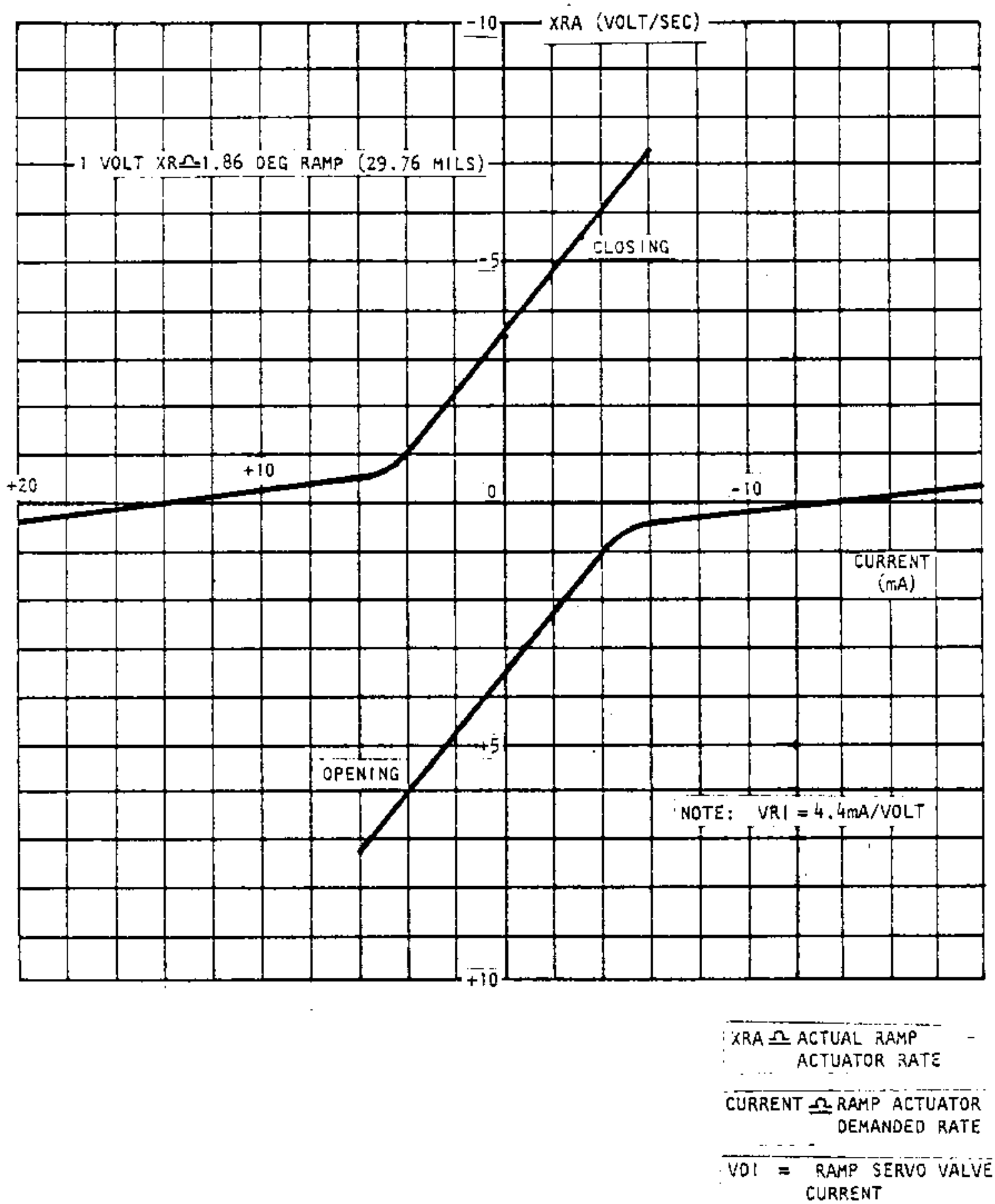
Monitor Failures

Table 109 (concluded)



Overall Spill Actuator Monitor
(Nominal Curves for 'S' Monitor)

Table 110



Overall Ramp Actuator Monitor
(Nominal Curves for 'M' Monitor)

Table 111

POSITION	AICU CONNECTIONS		SIGNAL TITLE
	DVM +ve	DVM -ve	
1	23	56	MACH X MON
2	98	56	INCIDENCE X MON
3	96	56	SIDESLIP X MON
4	72	56	Pv MONITOR
5	1	20	P α
6	15	20	$N_1/\sqrt{\theta}$
7	48	20	$\phi\eta$
8	64	20	η ve
9	55	20	XRB
10	67	20	XDB
11	57	20	NOT ALLOCATED
12	43	20	XDD
13	21	20	XRD
14	AS CONTROLLED BY SELECTOR B		

AICU Analogue Signals - Selector A

Table 112

POSITION	AICU CONNECTIONS		SIGNAL TITLE
	DVM +ve	DVM -ve	
1	81	73	NOT ALLOCATED
2	68	73	VIR
3	93	73	VID
4	37	73	XR MIN.
5	62	73	XR MAX. 1
6	87	73	XR MAX. 2
7		73	NOT ALLOCATED
8		74	NOT ALLOCATED
9		74	NOT ALLOCATED
10		74	NOT ALLOCATED
11		74	NOT ALLOCATED
12	SIMULATED N1		
13	SIMULATED Pv MONITOR		
14	SIMULATED Pv CONTROL		

AICU Analogue Signals - Selector B

Table 113

PARAMETER		TE 6055 LOCATION						SCALING		
CODE	DESCRIPTION	F.T.C. PIN		SELECTOR		H/W INST.		PHYSICAL VALUE	DVM VOLTS	H/W BITS
		HI	LO	A	B	MAIN	SUB			
α i	Incidence vane angle–	NA	NA	NA	NA	7	1	fully raised +35° mid travel 0° fully lowered -35°	N.A.	0 2048 4095
P_s(i)	Static sensor pressure	NA	NA	NA	NA	34	1	0 psia 14.7 psia Sea Level Atmospheric	N.A	0 3169
P_t(i)	Pitot sensor pressure	NA	NA	NA	NA	44	1	0 psia 14.7 psia Sea Level Atmospheric	N.A.	0 3169
N_1	Low Pressure Compressor Speed	65	20	NA	NA	203	1	40% 100%	1.19 5.48	488 2214
X_{RA}	Ramp Resolver Angle - Control)	NA	NA	NA	NA	173	1	fully raised +30°	0.31	128
X_{RB}	" " " - Monitor)	55	20	9	OFF	173	3	mid travel 0°	5.00	2048
X_{DA}	Spill " " - Control)	NA	NA	NA	NA	178	1	fully lowered -30°	9.69	3968
X_{DB}	" " " - Monitor)	67	20	10	OFF	178	3			
P_{VA}	Ramp Void Pressure - Control)	NA	NA	NA	NA	295	1*	(0 psia	0	0
P_{VB}	" " " - Monitor)	72	56	4	OFF	NA	NA	(14.7 psia Sea Level Atmospheric	7.74	3169
$N_1/\sqrt{\theta}$	N_1 Limiter command to E.C.S.	15	20	6	OFF	380	1	96.2% (M ∞ <1.78) 86.2% (M ∞ =2.06) 79.9% (M ∞ =2.12)	0 2.86 4.38	0 1172 1795
P α	Total pressure correction to E.C.S.	1	20	5	OFF	138	1	0.psia 13.4 psia 14.7 psia	0 7.07 7.07	0 2896 2896
α X-MON	Incidence Cross Monitor Signal	98	56	2	OFF	18	1	- 7.4° 24.6° 6° (α at mid travel P_{si} P_{Ti} 14.7)	0 10 4.19	0 4096 1716
M X-MON	Mach Cross Monitor Signal	23	56	1	OFF	79	1	M ∞ = 0 M ∞ = 2	0.88 4.95	359 2030
V_{IR}	Ramp Servo Valve current	68	73	14	2	NA	NA	0mA	0	NA
V_{ID}	Spill " " ")	93	73	14	2	NA	NA	(+20mA (-6mA (Normal current at M ∞ =0)	4.55 1 36	NA NA
PFC	Automatic Test Word)	NA	NA	NA	NA	225	1**	NA	NA	NA

* Supersonic only ** Sub/Transonic only

Program Parameter Location and Scaling
(Program Issue 314)

Table 114

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MACH NO.	ALTITUDE	THUMBWHEEL SWITCH SETTING (DECIMAL)					ABSOLUTE PRESSURE (m bar)	
		α VANE	Ps		Pt		Pv	
		ALL SUs	SU 2	SU 1, 3 & 4	SU 2	SU 1, 3 & 4	INNER	OUTER
0.3	500	1258	3102	3106	3312	3312	NA	NA
0.35	500	1386	3099	3104	3387	3386	NA	NA
0.4	1250	1663	3018	3018	3381	3380	NA	NA
0.67	6200	2102	2489	2489	3406	3404	NA	NA
0.77	14300	2173	1809	1817	2724	2721	NA	NA
0.80	16300	2190	1666	1674	2588	2584	NA	NA
1.01	30000	2298	0913	0920	1804	1800	NA	NA
1.27	38000	2244	0636	0639	1692	1703	NA	NA
1.30	38300	2232	0629	0631	1742	1765	417	403
1.40	36500	2201	0692	0693	2118	2146	498	483
	39700	2201	0593	0594	1816	1840	427	414
	57800	2201	0249	0249	0761	0771	179	174
1.60	39900	2201	0590	0591	2245	2310	521	512
	42500	2201	0520	0522	1981	2039	459	451
	59500	2201	0230	0231	0875	0901	203	199
1.70	44000	2202	0484	0487	2046	2125	475	467
1.80	42800	2200	0513	0517	2397	2513	552	552
	45300	2200	0455	0459	2125	2229	490	490
	60000	2200	0224	0226	1049	1100	241	241

Computed Settings for given Mach Nos.
Table 115 (Contd)

MACH NO.	ALTITUDE	THUMBWHEEL SWITCH SETTING (DECIMAL)					ABSOLUTE PRESSURE (m bar)	
		α VANE	Ps		Pt		Pv	
		ALL SUs	SU 2	SU 1, 3 & 4	SU 2	SU 1, 3 & 4	INNER	OUTER
1.90	47800	2198	0403	0408	2075	2202	448	455
2.00	47000	2207	0418	0425	2366	2551	473	492
	50000	2207	0362	0368	2048	2208	410	426
	60000	2207	0224	0228	1267	1366	254	264
2.02	47500	2209	0408	0415	2352	2544	477	485
	50500	2209	0353	0360	2036	2203	413	420
	60000	2209	0224	0228	1290	1395	262	267
2.05	48100	2213	0396	0404	2347	2552	484	480
	51200	2213	0341	0348	2022	2199	417	413
	60000	2213	0223	0228	1325	1440	273	270

Computed Settings for given Mach Nos.
Table 115 (concluded)

Z	LOGIC 'O'	LOGIC '1'
11 (Msb)	PFC Logic assumes dummy lane in use = 1 signal	Lane in use signal (0,1)
10	SW 2 set to 1 (i.e. processor p.f.c.)	Status word bit 2 set to 0
9	Sets Lock Test o/p = 28 volts	Sets Lock Test o/p = o/c
8	Allows N_{1A} Signal to N_1 windings	Short circuits N_{1A} signal (provided lane in use=1)
7	Feeds N_1 Ref.(35% N_{1D})	Feeds N_{1A},N_{1B} to N_1 windings
6	Feeds -15 volts to Comparator Test Inputs	Allows +15 volts or 0 Volts to Comparator Test Inputs (see Z_5)
5	Feeds +15 volts to Comparator Test Inputs (with Z_6 = 1)	Feeds 0 volts to Comparator Test Inputs (with Z_6 = 1)
4 3 2 1 0	Failure Monitor Check address bits	

Pre-Flight Check Word - Logic Conditions

Table 116

FAILURE CHECK ADDRESS Z0	Z1	Z2	Z3	Z4	MONITOR FAILED
0	0	0	0	0	No failures
1	0	0	1	0	Fail N
0	1	0	1	0	Fail M
0	0	1	1	0	Fail K
1	0	1	1	0	Fail J
0	1	1	1	0	Fail I
1	1	1	1	0	Fail H
1	1	1	0	1	Fail Q
0	0	0	1	1	Fail P
1	1	0	1	1	Fail W
0	0	1	1	1	Fail V
1	0	1	1	1	Fail U
0	1	1	1	1	Fail T
1	1	1	1	1	Fail S

Pre-Flight Check Word - Failure Check Address

Table 117

PIN NO.	SIGNAL DESCRIPTION	
1	E CORE EXCIT. HIGH	CONTROL PV SENSOR
2	VOLTAGE F/B	CONTROL PV SENSOR
3	CURRENT SENSE	CONTROL PV SENSOR
4	E CORE OUTPUT HIGH	CONTROL PV SENSOR
5	E CORE EXCIT. LOW	CONTROL PV SENSOR
6	SCREEN	CONTROL PV SENSOR
7	$\overline{\text{LANE IN USE}}$	FAILURE MONITORING
8	UNUSED	
9	COMMON	RAMP CONTROL RESOLVER
10	SCREEN	RAMP CONTROL RESOLVER
11	COMMON	SPILL MONITOR RESOLVER
12	SCREEN	SPILL MONITOR RESOLVER
13	TEMP. COMP. INPUT	CONTROL PV SENSOR
14	+10V OUTPUT	CONTROL PV SENSOR
15	-10V OUTPUT	CONTROL PV SENSOR
16	E CORE OUTPUT LOW	CONTROL PV SENSOR
17	TORQUE MOTOR LOW	CONTROL PV SENSOR
18	TORQUE MOTOR HIGH	CONTROL PV SENSOR
19	LANE/HYDRAULICS IN USE RETURN	FAILURE MONITORING
20	UNUSED	
21	SIN) — XRA	RAMP CONTROL RESOLVER
22	COS)	RAMP CONTROL RESOLVER
23	SIN) — XDB	SPILL MONITOR RESOLVER
24	COS)	SPILL MONITOR RESOLVER
25	UNUSED	
26	SCREEN	CONTROL PV SENSOR
27	OV. REFERENCE	IDENT WIRING
28	SCREEN	CONTROL PV SENSOR
29	SCREEN	CONTROL PV SENSOR
30	OV. REFERENCE	IDENT WIRING

AICU Connector SKA-A Pin Functions

Table 118

PIN NO.	SIGNAL DESCRIPTION	
31	PORT/STARBD INTAKE	IDENT WIRING
32	3.9V REFERENCE	IDENT WIRING
33	3.9V REFERENCE	IDENT WIRING
34	N_{1A} SIGNAL	ENGINE SPEED PROBE
35	N_{1A} SCREEN	ENGINE SPEED PROBE
36	UNUSED	
37	SCREEN EARTH	
38	UNUSED	
39	UNUSED	
40	INCIDENCE COMP. 1 SCREEN	
41	0V REFERENCE	IDENT WIRING
42	PORT/STARBD/NOSE MSB	IDENT WIRING
43	PORT/STARBD/NOSE LSB	IDENT WIRING
44	3.9V REFERENCE	IDENT WIRING
45	3.9V REFERENCE	IDENT WIRING
46	A/C SELECT 2	IDENT WIRING
47	OV REFERENCE	IDENT WIRING
48	N_{1A} RETURN	ENGINE SPEED PROBE
49	UNUSED	
50	MACH. OUTPUT SCREEN	CROSS COMPARISON
51	UNUSED	
52	MACH. COMP. 2 SCREEN	CROSS COMPARISON
53	INCIDENCE COMP. 1 SIGNAL	CROSS COMPARISON
54	INCIDENCE COMP. 1 RETURN	CROSS COMPARISON
55	INCIDENCE OUTPUT SIGNAL	CROSS COMPARISON
56	INCIDENCE COMP. 2 SIGNAL	CROSS COMPARISON

AICU Connector SKA-A Pin Functions

Table 118 (Continues)

PIN NO.	SIGNAL DESCRIPTION	
57	INCIDENCE COMP. 2 RETURN	CROSS COMPARISON
58	INCIDENCE OUTPUT RETURN	CROSS COMPARISON
59	SIDESLIP COMP. 1 SIGNAL	CROSS COMPARISON
60	SIDESLIP COMP. 1 RETURN	CROSS COMPARISON
61	MACH. OUTPUT SIGNAL	CROSS COMPARISON
62	MACH. COMP. 1 SIGNAL	CROSS COMPARISON
63	MACH. COMP. 1 RETURN	CROSS COMPARISON
64	MACH. OUTPUT RETURN	CROSS COMPARISON
65	MACH. COMP. 2 SIGNAL	CROSS COMPARISON
66	MACH.COMP. 2 RETURN	CROSS COMPARISON
67	DATA SCREEN	CONTROL HIGHWAY
68	POWER SCREEN	CONTROL HIGHWAY
69	INCIDENCE OUTPUT SCREEN	CROSS COMPARISON
70	INCIDENCE COMP. 2 SCREEN	CROSS COMPARISON
71	SIDESLIP OUTPUT SIGNAL	CROSS COMPARISON
72	SIDESLIP OUTPUT RETURN	CROSS COMPARISON
73	SIDESLIP COMP. 1 SCREEN	CROSS COMPARISON
74	UNUSED	
75	MACH. COMP. 1 SCREEN	CROSS COMPARISON
76	UNUSED	
77	UNUSED	
78	UNUSED	
79	UNUSED	
80	DATA +	CONTROL HIGHWAY
81	POWER +	CONTROL HIGHWAY
82	DATA MATCH	CONTROL HIGHWAY
83	ADDRESS MATCH	TEST HIGHWAY
84	SIDELSIP OUTPUT SCREEN	CROSS COMPARISON
85	SIDESLIP COMP. 2 SIGNAL	CROSS COMPARISON
86	SIDESLIP COMP. 2 RETURN	CROSS COMPARISON

AICU Connecor SKA-A Pin Functions

Table 118 (continues)

PIN NO.	SIGNAL DESCRIPTION	
87	UNUSED	
88	UNUSED	
89	HOLD	FAILURE MONITORING
90	RAMP FAILED	FAILURE MONITORING
91	N_1 NOT FAILED	FAILURE MONITORING
92	SIDESLIP NOT FAILED	FAILURE MONITORING
93	INCIDENCE NOT FAILED	FAILURE MONITORING
94	DATA -	CONTROL HIGHWAY
95	POWER -	CONTROL HIGHWAY
96	DATA -	CONTROL HIGHWAY
97	CLOCK MATCH	TEST HIGHWAY
98	SIDESLIP COMP. 2 SCREEN	CROSS COMPARISON
99	D.C. EARTH	FAILURE MONITORING
100	UNUSED	
101	N_1 NOT FAILED 2	FAILURE MONITORING
102	ECS 4 'A'	FAILURE MONITORING
103	HOLD REQUIRED 2	FAILURE MONITORING
104	SPILL FAILED	FAILURE MONITORING
105	UNUSED	
106	LANE GOOD 1	FAILURE MONITORING

AICU Connector SKA-A Pin Functions

Table 118 (concluded)

PIN NO.	SIGNAL DESCRIPTION	
1	E CORE EXCIT. HIGH	MONITOR Pv SENSOR
2	VOLTAGE F/BACK	MONITOR Pv SENSOR
3	CURRENT SENSE	MONITOR Pv SENSOR
4	E CORE OUTPUT HIGH	MONITOR Pv SENSOR
5	E CORE EXCIT. LOW	MONITOR Pv SENSOR
6	SCREEN	MONITOR Pv SENSOR
7	HYDRAULICS IN USE SIGNAL	FAILURE MONITORING
8	UNUSED	
9	COMMON	SPILL CONTROL RESOLVER
10	SCREEN	SPILL CONTROL RESOLVER
11	COMMON	RAMP MONITOR RESOLVER
12	SCREEN	RAMP MONITOR RESOLVER
13	TEMP. COMP. INPUT	MONITOR Pv SENSOR
14	+ 10V OUTPUT	MONITOR Pv SENSOR
15	- 10V OUTPUT	MONITOR Pv SENSOR
16	E CORE OUTPUT LOW	MONITOR Pv SENSOR
17	TORQUE MOTOR LOW	MONITOR Pv SENSOR
18	TORQUE MOTOR HIGH	MONITOR Pv SENSOR
19	UNUSED	
20	UNUSED	
21	SIN) — X_{DA}	SPILL CONTROL RESOLVER
22	COS)	SPILL CONTROL RESOLVER
23	SIN) — X_{RB}	RAMP MONITOR RESOLVER
24	COS)	RAMP MONITOR RESOLVER
25	UNUSED	
26	SCREEN	MONITOR Pv SENSOR
27	Pv MONITOR SIGNAL	AIDS
28	SCREEN	MONITOR Pv SENSOR
29	X_R MONITOR SIGNAL	AIDS
30	SCREEN	MONITOR Pv SENSOR

AICU Connector SKA-B Pin Functions

Table 119 (continues)

PIN NO.	SIGNAL DESCRIPTION	
31	X_D RETURN MONITOR	AIDS
32	LANE GOOD 2	FAILURE MONITORING
33	UNUSED	
34	N_{1B} SIGNAL	ENGINE SPEED PROBE
35	$\overline{\text{LANE IN USE B}}$	FAILURE MONITORING
36	UNUSED	
37	UNUSED	
38	UNUSED	
39	115V.400Hz INPUT POWER	
40	ECS 4 'B'	ENGINE CONTROL
41	Pv SCREEN	AIDS
42	Pv RETURN MONITOR	AIDS
43	X_R SCREEN	AIDS
44	$\overline{\text{LANE IN USE C}}$	FAILURE MONITORING
45	X_D MONITOR SIGNAL	AIDS
46	UNUSED	
47	N_{1B} RETURN	ENGINE SPEED PROBE
48	N_{1B} SCREEN	ENGINE SPEED PROBE
49	COMP. CHECK IN	FAILURE MONITORING
50	COMP. CHECK OUT	FAILURE MONITORING
51	UNUSED	
52	UNUSED	
53	ECS 2 'A'	ENGINE CONTROL
54	ECS 2 'B'	ENGINE CONTROL
55	ECS 1 'A'	ENGINE CONTROL
56	X_R RETURN MON	AIDS
57	E-LINE DIPPED	ENGINE CONTROL
58	X_D SCREEN	AIDS
59	ECS 1 'B'	ENGINE CONTROL
60	UNUSED	

AICU Connector SKA-B Pin Functions

Table 119 (continues)

PIN NO.	SIGNAL DESCRIPTION	
61	UNUSED	
62	UNUSED	
63	ECS 3 'A'	ENGINE CONTROL
64	ECS 3 'B'	ENGINE CONTROL
65	E LINE NOT DIPPED	ENGINE CONTROL
66	NORMAL MODE	ENGINE CONTROL
67	CLOCK SCREEN	TEST HIGHWAY
68	ADDRESS SCREEN	TEST HIGHWAY
69	DATA SCREEN	TEST HIGHWAY
70	POWER SCREEN	TEST HIGHWAY
71	P SIGNAL	ENGINE CONTROL
72	P RETURN	ENGINE CONTROL
73	UNUSED	
74	TEST RETURN	PRE-FLIGHT CHECK
75	UNUSED"	
76	UNUSED	
77	UNUSED	
78	UNUSED	
79	LOCK TEST	PRE-FLIGHT CHECK
80	CLOCK -	TEST HIGHWAY
81	CLOCK -	TEST HIGHWAY
82	ADDRESS +	TEST HIGHWAY
83	DATA +	TEST HIGHWAY
84	POWER + UNSTABILISED	TEST HIGHWAY
85	N_1 SIGNAL	ENGINE CONTROL
86	N_1 RETURN	ENGINE CONTROL
87	UNUSED	
88	UNUSED	
89	115V.400Hz RETURN	INPUT POWER
90	BONDING	
91	SPILL DRIVE +	SPILL CONTROL

AICU Connector SKA-B Pin Functions

Table 119 (continues)

PIN NO.	SIGNAL DESCRIPTION	
92	UNUSED	
93	RAMP DRIVE +	RAMP CONTROL
94	CLOCK +	TEST HIGHWAY
95	ADDRESS -	TEST HIGHWAY
96	ADDRESS -	TEST HIGHWAY
97	DATA -	TEST HIGHWAY
98	POWER - UNSTABILISED	TEST HIGHWAY
99	n_{VE} SIGNAL	AIDS
100	n_{VE} RETURN	AIDS
101	TEST SELECT	PRE-FLIGHT CHECK
102	UNUSED	
103	SCREEN EARTH	
104	SPILL DRIVE -	SPILL CONTROL
105	UNUSED	
106	RAMP DRIVE -	RAMP CONTROL

AICU Connector SKA-B Pin Functions

Table 119 (concluded)

APPENDIX A

AICS RECURRENT IN-FLIGHT FAILURE MAINTENANCE ACTION

It may be experienced that recourse to the Maintenance Manual Trouble Shooting procedures fails to diagnose the cause of a reported in-flight defect which then recurs on subsequent flights.

This Appendix describes a suggested course of maintenance actions to deal with such defects. These actions are based on the reported indications shown on the "Failure Display" captions of the Air Intake Test Panel (AITP) (Ref. MM Ch.71-61-00). These actions should be further influenced by any sub-script number shown on the captions and directed at the appropriate engine or unit.

Where more than one course of action is given, the results of previous diagnosis and rectification should be used to determine the appropriate action.

To achieve the best results with these maintenance actions it is important that only one course of action is taken between flights. Proper recording and monitoring of the recurring defects and courses of action is also important.

The abbreviation "LRU" (Line Replaceable Unit) used in this Appendix refers to the units indicated on the AITP display.

Units removed should be despatched for immediate workshop testing. They should be accompanied by a full description and history of the defect giving as much detail as possible. If the workshop testing identifies a defect which could cause the aircraft malfunction, further rectification may be avoided.

APPENDIX A - AICS RECURRENT FLIGHT FAILURE

WARNING: OBSERVE THE AIR INTAKE SAFETY PRECAUTIONS DETAILED IN THE MAINTENANCE MANUAL CHAPTER 71-00-00 SERVICING. OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN THE MAINTENANCE MANUAL CHAPTER 24-00-00 AND 29-00-00.

A. SENSOR UNIT, INCIDENCE VANES

AITP DISPLAYED LRU FAULT IDENT. LIGHTS - POSSIBLE INDICATIONS
SU, SU RA SA, SU CU, or SU CU RA SA
RECOMMENDED DIAGNOSTIC ACTION
1. Change Sensor Unit for affected lane(s). If fault giving the above LRU indications does not occur within the next three flights on these lane(s) // END.
2. If fault giving the above LRU indications occurs within the next three flights on these lane(s) - change starboard or port incidence vane. If fault giving the above LRU indications on these lane(s) does not occur within the next three flights // END.
3. If fault giving the above LRU indications occurs within the next three flights on these lane(s) - change remaining incidence vane. If fault giving the above LRU indications on these lane(s) does not occur within the next three flights // END.
4. If fault giving the above LRU indications occurs within the next three flights on these lane(s) - check Data Highway wiring and connectors from SU to AICU'S, particularly aircraft side of SU DPX connector for pushed-back or damaged pins and Highway terminations at back of aircraft. Also check wiring from incidence vanes to SU connectors. // END.

APPENDIX A - AICS RECURRENT FLIGHT FAILURES

B. CONTROL UNIT *RAMP AND* SPILL RESOLVERS
*see also items D and E of this Appendix.

AITP DISPLAYED LRU FAULT IDENT. LIGHTS - POSSIBLE INDICATIONS CU OR CU RA SA
RECOMMENDED DIAGNOSTIC ACTION
1. Interchange AICU of affected lane with an AICU from an intake with both control lanes serviceable on the last three flights. If fault giving the above LRU indication occurs within the next three flights on the lane now containing the suspect AICU - change AICU // END.-
2. If fault giving the above LRU indications occurs within the next three flights on the original lane - change ramp actuator resolver pack for that lane. If fault giving the above LRU indication on this lane does not occur within the next three flights // END.
3. If fault giving the above LRU indication occurs within the next three flights on the original lane - check ramp actuator resolver pack wiring and connectors, from intake to Interface Unit, particularly aircraft side plugs on resolver pack in the intake. Also check aircraft side of AICU DPX connector for pushed back or damaged pins. If no obvious fault is found change spill actuator resolver pack for that intake. If fault giving the above LRU indications on this lane does not occur within the next three flights // END.
4. If fault giving the above LRU indications occurs within the next three flights on the original lane - check spill actuator resolver pack wiring and connectors, from intake to Interface Unit, particularly aircraft side plugs on resolver pack in the intake wall. If no obvious fault is found change Sensor Unit for that lane. If fault giving the above LRU indications on this lane does not occur within the next three flights // END.

APPENDIX A - AICS RECURRENT FLIGHT FAILURES

B. CONTROL UNIT, RAMP AND SPILL RESOLVERS (Cont)

AITP DISPLAYED LRU FAULT IDENT. LIGHTS - POSSIBLE INDICATIONS
CU, OR CU RA SA
RECOMMENDED DIAGNOSTIC ACTION
5. If fault giving the above LRU indications occurs within the next three flights on the original lane - change prime source incidence vane for that lane. (Port vane for lanes 1A, 2A, 3B, 4B; starboard vane for lanes 1B, 2B, 3A, 4A). If fault giving the above LRU indications on this lane does not occur within the next three flights // END.
6. If fault giving the above LRU indications occurs within the next three flights on the original lane - check Data Highway wiring and connectors from SU to relevant AICU, particularly Highway terminations at back of aircraft. Also check wiring from the incidence vane to this SU, particularly connectors for pushed-back or damaged pins. If no obvious fault is found change Pv CONTROL pressure sensor for that lane. If fault giving the above LRU indications on this lane does not occur within the next three flights // END.
7. If fault giving the above LRU indications occurs within the next three flights on the original lane - check Pv CONTROL sensor wiring and connectors, from intake to Interface Unit, particularly aircraft-side plugs on Pv sensor in the intake. If no obvious fault is found change N1 speed probe for affected intake/engine. If fault giving the above LRU indications on this lane does not occur within the next three flights // END.

APPENDIX A - AICS RECURRENT FLIGHT FAILURES

B. CONTROL UNIT, RAMP AND SPILL RESOLVERS (Cont)

AITP DISPLAYED LRU FAULT IDENT. LIGHTS - POSSIBLE INDICATIONS

CU, OR CU RA SA

RECOMMENDED DIAGNOSTIC ACTION

8. If fault giving the above LRU indications occurs within the next three flights on the original lane - check NI probe wiring and connectors from engine to the Interface Unit, particularly the aircraft side of the N1 probe connector. Also check that neither AICU fed by the probe presents a low impedance input to the probe signals. If no obvious fault is found check all Incidence and Mach No. cross-monitor inputs are correct at the DPX of the relevant AICU with the incidence vanes set to zero degrees using protractor tool.

LANE AFFECTED	INCIDENCE X-MONITOR I/P's	MACH X-MONITOR I/P's
1A (AICU 1)	1B & 2B (AICU's 2 & 4)	2B & 3B (AICU's 4 & 6)
1B (AICU 2)	1A & 2A (AICU's 1 & 3)	2A & 4B (AICU's 3 & 8)
2A (AICU 3)	1B & 2B (AICU's 2 & 4)	1B & 4B (AICU's 2 & 8)
2B (AICU 4)	1A & 2A (AICU's 1 & 3)	1A & 3B (AICU's 1 & 6)
3A (AICU 5)	3B & 4B (AICU's 6 & 8)	2A & 4B (AICU's 3 & 8)
3B (AICU 6)	3A & 4A (AICU's 5 & 7)	1A & 4A (AICU's 1 & 7)
4A (AICU 7)	3B & 4B (AICU's 6 & 8)	1A & 3B (AICU's 1 & 6)
4B (AICU 8)	3A & 4A (AICU's 5 & 7)	2A & 3A (AICU's 3 & 5)

The Incidence cross-monitor signals are measured on pins AA 53/54 for one source and AA 56/57 for the other. The signals should be 2.1 V a.c. rms ± 0.2V.

The Mach cross-monitor signals are measured on pins AA 62/63 for one source and AA 65/66 for the other. The signals should be 0.44 V a.c. rms ± 0.1V.

If all are correct change one of the ECU's for the intake /engine with the faulty AICS lane.

If fault giving the above LRU indications on this lane does not occur within the next three flights // END.

APPENDIX A - AICS RECURRENT FLIGHT FAILURES

B. CONTROL UNIT, RAMP AND SPILL RESOLVERS (Cont)

AITP DISPLAYED LRU FAULT IDENT. LIGHTS - POSSIBLE INDICATIONS
CU OR CU RA SA
RECOMMENDED DIAGNOSTIC ACTION
9. If fault giving the above LRU indications occurs within the next three flights on the original lane - change the remaining ECU for this intake/engine. If fault giving the above LRU indications on this lane does not occur within the next three flights // END.
10. If fault giving the above LRU indications occurs within the next three flights on the original lane - check aircraft wiring between AICU and ECU's particularly for short or low impedance to airframe earth or across AICU N1 limiter outputs. If no obvious fault is found - change Interface Unit 'Z' card for that lane. // END

APPENDIX A - AICS RECURRENT FLIGHT FAILURES

C. VOID PRESSURE SENSORS - CONTROL AND MONITOR

AITP DISPLAYED LRU FAULT IDENT. LIGHTS - POSSIBLE INDICATIONS
PV, OR PV RA SA
RECOMMENDED DIAGNOSTIC ACTION
1. Interchange AICU of affected lane with an AICU from an intake with both control lanes serviceable on the last three flights. If fault giving the above LRU indication occurs within the next three flights on the lane now containing the suspect AICU - change AICU // END.
2. If fault giving the above LRU indication occurs within the next three flights on the original lane - change Pv CONTROL and Pv MONITOR pressure sensors for that lane. If fault giving the above LRU indication on this lane does not occur within the next three flights // END.
3. If fault giving the above LRU indication occurs within the next three flights on the original lane - check Pv CONTROL and Pv MONITOR sensor wiring and connectors, from intake to Interface Unit, particularly aircraft-side plugs on Pv sensors in the intake. Also check aircraft side of AICU DPX connector for pushed-back or damaged pins. // END.

APPENDIX A - AICS RECURRENT FLIGHT FAILURES

D. RAMP RESOLVERS

AITP DISPLAYED LRU FAULT IDENT. LIGHTS - POSSIBLE INDICATIONS
RP, RP RA SA, RP CU, OR RP CU RA SA
RECOMMENDED DIAGNOSTIC ACTION
1. Interchange AICU of affected lane with an AICU from an intake with both control lanes serviceable on the last three flights. If fault giving the above LRU indication occurs within the next three flights on the lane now containing the suspect AICU - change AICU // END
2. If fault giving the above LRU indication occurs within the next three flights on the original lane - change ramp actuator resolver pack for that lane. If fault giving the above LRU indication on this lane does not occur within the next three flights // END.
3. If fault giving the above LRU indication occurs within the next three flights on the original lane - check ramp actuator resolver pack wiring and connectors from intake to Interface Unit, particularly aircraft-side plugs on resolver pack in the intake. Also check aircraft side of AICU DPX connector for pushed-back or damaged pins. // END

APPENDIX A - AICS RECURRENT FLIGHT FAILURES

E. SPILL RESOLVERS

AITP DISPLAYED LRU FAULT IDENT. LIGHTS - POSSIBLE INDICATIONS
SP, SP RA SA, SP CU, OR SP CU RA SA
RECOMMENDED DIAGNOSTIC ACTION
1. Interchange AICU of affected lane with an AICU from an intake with both control lanes serviceable on the last three flights. If fault giving the above LRU indication occurs within the next three flights on the lane now containing the suspect AICU - change AICU // END.
2. If fault giving the above LRU indication occurs within the next three flights on the original lane - change spill actuator resolver pack for that intake. If fault giving the above LRU indication on this lane does not occur within the next three flights // END.
3. If fault giving the above LRU indication occurs within the next three flights on the original lane - check spill actuator resolver pack wiring and connectors from intake to Interface Unit, particularly aircraft-side plugs on resolver pack in the intake wall. Also check aircraft side of AICU DPX connector for pushed-back or damaged pins. // END.

APPENDIX A - AICS RECURRENT FLIGHT FAILURES

F. ENGINE SPEED PROBE (N1)

AITP DISPLAYED LRU FAULT IDENT. LIGHTS - POSSIBLE INDICATIONS
N1, N1 RA SA, N1 CU, or N1 CU RA SA
RECOMMENDED DIAGNOSTIC ACTION
1. Change N1 speed probe for affected intake/engine. If fault giving the above LRU indications does not occur within the next three flights // END.
2. If fault giving the above LRU indications occurs within the next three flights - check N1 probe wiring and connectors from the engine to the Interface Unit particularly the aircraft side of the N1 probe connector. Also check that neither AICU fed by the probe presents shorted or low impedance inputs to the probe signals. // END.

APPENDIX A - AICS RECURRENT FLIGHT FAILURES

G. INCIDENCE VANES α

AITP DISPLAYED LRU FAULT IDENT. LIGHTS - POSSIBLE INDICATIONS
α, α RA SA, α SU, α SU RA SA, α SU CU α SU CU RA SA, α CU, or α CU RA SA.
RECOMMENDED DIAGNOSTIC ACTION
1. Change port or starboard incidence vane. If fault giving the above LRU indications does not occur within the next three flights // END.
2. If fault giving the above LRU indications occurs within the next three flights - change remaining incidence vane. If fault giving the above LRU indications does not occur within the next three flights // END.
3. If fault giving the above LRU indications occurs within the next three flights - check incidence vane wiring and connectors for both incidence vanes from incidence vanes to Sensor Units. Also check that no Sensor Unit presents a shorted or low impedance input to incidence vane signals. // END.

INTAKE RAMP ACTUATION - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. paras.3., 4. and 5.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

R Further assumptions are that hydraulic power (Ref. Chap.29) is available, and that the air intake control system (AICS) and inching facilities are serviceable.

In the interest of safety, all persons not connected with this trouble shooting must be excluded from inside all intakes and from the area in the immediate vicinity of all spill doors.

2. Preparation

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Stopwatch	-

B. Prepare

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel to indicate that work is being carried out on the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the main system (green or blue) or to yellow (standby) system as required in the particular test.

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

R (6) Trip the following circuit breakers and fit safety
R clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	E22

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 2 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3

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SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

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3. Trouble Shooting - Ramps Operation Using Main Hydraulic System

```
A.*******************************************
  *Prepare to trouble shoot (Ref. para.2.).*
  *Reset INT (1,2,3 or 4) MAIN HYD SUP     *
  *circuit breaker (Ref. para.2.B.(6))     *
  *associated with ramps under test. Make  *
  *available electrical ground power as    *
  *detailed in 24-41-00.                   *
  *Remove anti-interference plate from     *
  *intake management panel.                *
  *                                        *
  *Test as follows:                        *
  *Fully pressurize appropriate main       *
  *hydraulic system.                       *
  *Hold RAMP switch at "RAISE" to fully    *
  *raise ramps.                            *
  *Move and hold RAMP switch at "LOWER"    *
  *and check that ramps operate smoothly   *
  *and are fully lowered, including        *
  *snubbing, within 4.9 to 5.4 s. Move and *
  *hold RAMP switch at "RAISE" and check   *
  *that ramps operate smoothly and are     *
  *fully raised, including snubbing,       *
  *within 7.5 to 8.9 s. Release switch and *
  *depressurize hydraulic system.  IF -    *
  ******************************************
            |    |
            |    |     ----------------------------------
            |    |    |1. Ramps fail to operate, using   |
            OK   NOT OK-------|   main hydraulic system -          |
            |         |   Chart 101.                     |
            |         |2. Ramps fail to operate          |
            |         |   smoothly - Chart 103.          |
            |         |3. Ramps fail to raise/lower      |
            |         |   within time limits - Chart 104.|
            |         |4. Ramps fail to reach fully      |
            |         |   raised position - Chart 105.   |
            |         |5. Ramps fail to reach fully      |
            |         |   lowered position - Chart 106.  |
            |          ----------------------------------
            |
            |
```

B.**
*Switch off and disconnect electrical *
*ground power as detailed in 24-41-00. *
*Remove all tools and equipment. Ensure *
*that intake interior is clear of debris *
*and loose objects. Set HYD switches to *
*"AUTO". Set RAMP/SPILL MASTER switches *
*to "MAN". Remove locking pins from *
*selector valves of all intakes. Reset *
all circuit breakers previously tripped.
****

4. Trouble Shooting - Ramps Operation Using Standby Hydraulic System

A.**
Prepare to trouble shoot (Ref. para.2.).
*Reset INT (1,2,3 or 4) ST'BY HYD SUP *
*circuit breaker (Ref. para.2.B.(6)) *
*associated with ramps under test. Make *
*available electrical ground power as *
*detailed in 24-41-00. *
*Remove anti-interference plate from *
*intake management panel. *
* *
*Test as follows: *
*Fully pressurize standby hydraulic *
*system. Hold RAMP switch at "RAISE" to *
*fully raise ramps. *
*Move and hold RAMP switch at "LOWER" *
*and check that ramps operate smoothly *
*and are fully lowered, including *
*snubbing, within 4.9 to 5.4 s. Move and *
*hold RAMP switch at "RAISE" and check *
*that ramps operate smoothly and are *
*fully raised, including snubbing, *
within 7.5 to 8.9 s. Release switch and
*depressurize hydraulic system. IF - *
****

```
          |    |
          |    |   ----------------------------------
          |    |  |1. Ramps fail to operate, using   |
          OK   NOT OK-------|   standby hydraulic system -  |
          |               |   Chart 102.               |
          |               |2. Ramps fail to operate smoothly |
          |               |   - Chart 103.             |
          |               |3. Ramps fail to raise/lower |
          |               |   within time limits - Chart 104.|
          |               |4. Ramps fail to reach fully |
          |               |   raised position - Chart 105. |
          |               |5. Ramps fail to reach fully |
          |               |   lowered position - Chart 106. |
          |                ----------------------------------
          |
B.*****************************************
 *Switch off and disconnect electrical    *
 *ground power as detailed in 24-41-00.   *
 *Remove all tools and equipment.  Ensure *
 *that intake interior is clear of debris *
 *and loose objects. Set HYD switches to  *
 *"AUTO".  Set RAMP/SPILL MASTER switches *
 *to "MAN".  Remove locking pins from     *
 *selector valves of all intakes. Reset   *
 *all circuit breakers previously tripped.*
 *****************************************
```

5. Trouble Shooting - Ramps Position Indicator System

```
A.*******************************************
  *Prepare to trouble shoot (Ref. para.2.).*
  *Reset INT (1,2,3 or 4) MAIN HYD SUP or   *
  *INT (1,2,3 or 4) ST'BY HYD SUP circuit   *
  *breaker (Ref. para.2.B.(6)) associated   *
  *with ramps under test.                   *
  *Make available electrical ground power   *
  *as detailed in 24-41-00.                 *
  *Remove anti-interference plate from      *
  *intake management panel.                 *
  *                                         *
  *Test as follows:                         *
  *Fully pressurize appropriate standby     *
  *hydraulic system. Hold RAMP switch at    *
  *"RAISE" until ramps are fully raised;    *
  *release switch. Check indicator displays*
  *0 per cent. Move and hold RAMP switch at*
  *"LOWER" until ramps are fully lowered;   *
  *release switch.  Check that indicator    *
  *displays 100 per cent. Move and hold     *
  *RAMP switch at "RAISE" until ramps are   *
  *fully raised; release switch.            *
  *Depressurize hydraulic system.  IF -     *
  ******************************************
             |    |
             |    |                -----------------------------------
             |    |               |1. Indicator fails to display 0 or|
             OK   NOT OK-------|   100 per cent with ramps fully  |
             |                    |   raised or fully lowered, as    |
             |                    |   appropriate - Chart 107.       |
             |                    |2. Ramps fail to reach fully      |
             |                    |   raised position - Chart 105.   |
             |                    |3. Ramps fail to reach fully      |
             |                    |   lowered position - Chart 106.  |
             |                     -----------------------------------
             |
B.*******************************************
  *Switch off and disconnect electrical     *
  *ground power as detailed in 24-41-00.    *
  *Remove all tools and equipment. Ensure   *
  *that intake interior is clear of debris *
  *and loose objects. Set HYD switches to   *
  *"AUTO".  Set RAMP/SPILL MASTER switches *
  *to "MAN".  Remove locking pins from      *
  *selector valves of all intakes. Reset    *
  *all circuit breakers previously tripped.*
  ******************************************
```

RAMPS FAIL TO OPERATE, USING MAIN HYDRAULIC SYSTEM.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
HYDRAULIC GROUND POWER SUPPLY	-
EQUIPMENT FOR ENTERING AND PROTECTING INTAKE INTERIOR	-
SUPPORT BLOCK	D925453000
SUPPORT BLOCK	D925453001
BRAKE RELEASE TOOL	E925089000

NOTE: Before renewal of components (*), check the associated run of wiring for continuity.

```
 -----------       -----------       -----------        -----------
|Repeat     |-----|Check ramps|-YES-|Check elec- |-NO-|Renew      |
|test, using|     |operate.   |     |trical con- |    |main       |
|standby    |      -----------      |trol of     |    |system     |
|hydraulic  |           |           |main        |    |motor of   |
|system     |           NO          |hydraulic   |    |Actuator   |
|(Ref. para.|           |           |system (Ref.|    |(1),(2),(3)|
|4.A.).     |           |           |71-00-39,   |    |or (4).    |
 -----------            |           |T/S). Is    |     -----------
                        |           |fault       |
                        |           |cleared?    |
                        |            ------------
                        |
       -----------------------------           -----------
      |Check screwjack threads for  |-YES-|Renew      |
      |discolouration or damage     |     |screwjack(s)|
      |(Ref. 71-63-00, I/C).        |     |of Actuator |
       -----------------------------      |(1),(2),(3) |
                        |                 |or (4).     |
                        NO                 -----------
                        |
 ------------------------------       -----------------
|Release brake, using brake    |-YES-|Renew brake unit |
|release tool. Check ramps can |     |of Actuator (1),  |
|be operated by turning the    |     |(2),(3) or (4).   |
|screwjack bodies.             |      -----------------
 ------------------------------
              |
    (Continued on Sheet 2)
```

Chart 101 (Sheet 1 of 2)

```
        (Continued from Sheet 1)
                 |
                 NO
                 |
    ----------------------------              ------------------------------
    |Disconnect Actuator (1),(2), |-YES-|*Renew Actuator (1),(2),(3)  |
    |(3) or (4) from mechanism.   |     |or (4).                      |
    |Check ramps can be raised and|     ------------------------------
    |lowered, manually.           |
    ----------------------------
                 |
                 NO
                 |
    ----------------------------
    |Check Mechanism (5),(6),(7)  |
    |or (8) for freedom from      |
R   |damage. If damaged, renew    |
R   |Mechanism (5),(6),(7) or (8).|
    ----------------------------
```

Chart 101 (Sheet 2 of 2)

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```
************************
*RAMPS FAIL TO OPERATE,*
*USING STANDBY         *
*SYSTEM.               *
************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
HYDRAULIC GROUND POWER SUPPLY	-
EQUIPMENT FOR ENTERING AND PROTECTING INTAKE INTERIOR	-
SUPPORT BLOCK	D925453000
SUPPORT BLOCK	D925453001
BRAKE RELEASE TOOL	E925089000

NOTE: Before renewal of components (*), check the associated run of wiring for continuity.

```
R  |Repeat      |-----|Check ramps|-YES-|Check elec-   |-NO-|Renew        |
R  |test, using |     |operate.   |     |trical con-   |    |standby      |
R  |main        |      -----------      |trol of       |    |system       |
R  |hydraulic   |          |            |standby       |    |motor of     |
R  |system      |          NO           |hydraulic     |    |Actuator     |
R  |(Ref. para. |          |            |system (Ref.  |    |(1),(2),(3)  |
R  |3.A.).      |          |            |71-00-39,     |    |or (4).      |
R                          |            |T/S). Is      |
R                          |            |fault         |
R                          |            |cleared?      |
R                          |
R                          |
R                          |
R                   |Check screwjack threads for |-YES-|Renew          |
R                   |discolouration or damage    |     |screwjack(s)   |
R                   |(Ref. 71-63-00, I/C).       |     |of Actuator    |
                                                        |(1),(2),(3)    |
                           |                            |or (4).        |
                           NO
                           |
R  |Release brake, using brake     |-YES-|Renew brake unit   |
R  |release tool. Check ramps can  |     |of Actuator (1),    |
R  |be operated by turning the     |     |(2),(3) or (4).     |
R  |screwjack bodies.              |
             |
```

(Continued on Sheet 2)

Chart 102 (Sheet 1 of 2)

(Continued from Sheet 1)

NO

Disconnect Actuator (1),(2), (3) or (4) from mechanism. Check ramps can be raised and lowered, manually.	-YES-	*Renew Actuator (1),(2),(3) or (4).

NO

Check Mechanism (5),(6),(7) or (8) for freedom from
R damage. If damaged, renew
R Mechanism (5),(6),(7) or (8).

Chart 102 (Sheet 2 of 2)

RAMPS FAIL TO OPERATE SMOOTHLY.

GROUND EQUIPMENT REQUIRED

DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
HYDRAULIC POWER SUPPLY	-
EQUIPMENT FOR ENTERING AND PROTECTING INTAKE INTERIOR	-
BRAKE RELEASE TOOL	E925089000
SUPPORT BLOCK	D925453000
SUPPORT BLOCK	D925453001

NOTE: Before renewal of components (*), check the associated run of wiring for continuity.

Operate ramps through full raise/lower cycle several times, using hydraulic system in use when fault was found. Check ramps operate smoothly.

-NO- Repeat test, but use alternative hydraulic system. Check ramps operate smoothly.

-YES- Renew hydraulic motor of Actuator (1),(2),(3) or (4) of system in use when fault was found.

NO

Check screwjack threads for discolouration or damage (Ref. 71-63-00, I/C).

-YES- Renew screw-jack(s) of Actuator (1),(2),(3) or (4).

NO

Release brake, using brake release tool. Turn the screw-jack bodies to fully lower and fully raise ramps. Check for smooth operation.

-YES- Renew brake unit of Actuator (1),(2),(3) or (4).

NO

(Continued on Sheet 2)

Chart 103 (Sheet 1 of 2)

(Continued from Sheet 1)

Disconnect Actuator (1),(2), (3) or (4) from mechanism. Manually, fully raise and fully lower ramps; check for smooth operation.

-YES- *Renew Actuator (1),(2),(3) or (4).

NO

Check wear of rear ramp hinges (Ref. 71-63-00 I/C). Is wear within limits?

-NO-- Rectify as necessary.

YES

Disconnect links of Rear Ramp (9),(10),(11) or (12) from mechanism. Raise and lower front ramp; check for smooth operation.

-YES- Check rear ramp links for freedom of movement. Check fairings of Rear Ramp (9), (10),(11) or (12) for correct clearances and freedom from damage. If necessary, adjust or renew as required.

NO

Disconnect links of Front Ramp (9),(10),(11) or (12) from mechanism. Check Mechanism (5),(6),(7), or (8) for smooth operation.

-YES- Check front ramp links for freedom of movement. Check hinges, seals and seal retainers of Front Ramp (9), (10),(11) or (12) for freedom from damage, and check seals and retainers for correct clearances. If necessary, adjust or renew as required.

NO

Check Mechanism (5),(6),(7) or (8) for freedom from damage. If damaged, renew Mechanism (5),(6),(7) or (8).

Chart 103 (Sheet 2 of 2)

RAMPS FAIL TO RAISE/LOWER WITHIN TIME LIMITS.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
HYDRAULIC POWER SUPPLY	-
EQUIPMENT FOR ENTERING AND PROTECTING INTAKE INTERIOR	-
BRAKE RELEASE TOOL	E925089000
SUPPORT BLOCK	D925453000
SUPPORT BLOCK	D925453001
SPRING BALANCE	-

NOTE: Before renewal of components (*), check the associated run of wiring for continuity.

Fully raise and fully lower ramps, using alternative hydraulic system to that in use when fault was found

Check ramps operate within time limits.

- YES → Check the electrical control of system in use when fault was found (Ref. 71-00-39, T/S). Is fault cleared?
  - NO → Renew motor of Actuator (1),(2),(3) or (4) of system in use when fault was found.
- NO → Check screwjack threads for discolouration or damage (Ref. 71-63-00, T/S).
  - YES → Renew screw-jack(s) of Actuator (1), (2),(3) or (4).
  - NO → (Continued on Sheet 2)

Chart 104 (Sheet 1 of 3)

(Continued from Sheet 1)

Release brake, using brake release tool. Turn the screw-jack bodies to fully lower and fully raise ramps. Check for smooth operation.	-YES-	Renew brake unit of Actuator (1),(2),(3) or (4).
NO		
Disconnect Actuator (1),(2), (3) or (4) from mechanism. Manually, fully raise and fully lower ramps; check for smooth operation.	-YES-	*Renew Actuator (1),(2),(3) or (4).
NO		
Check wear of rear ramp hinges (Ref. 71-63-00 I/C). Is wear within limits?	-NO--	Rectify as necessary.
YES		
Disconnect Links of Rear Ramp (9),(10),(11) or (12) from mechanism. Raise and lower front ramp; check for smooth operation.	-YES-	Check rear ramp links for freedom of movement. Check fairings of Rear Ramp (9), (10),(11) or (12) for correct clearances and freedom from damage. If necessary, adjust or renew as required.
NO		

(Continued on Sheet 3)

Chart 104 (Sheet 2 of 3)

(Continued from Sheet 2)

R Disconnect links of Front Ramp (9),(10),(11) or (12) from Mechanism, (5),(6),(7) or (8). Using a spring balance attached to a slave bolt inserted through link attachment holes in rear lever, check that force required to just move mechanism does not exceed 14 lbf 62.275 N).

-NO-- Check front ramp links for freedom of movement, Check hinges, seals and seal retainers of Front Ramp (9), (10),(11) or (12) for freedom from damage, and check seals and retainers for correct clearances. If necessary, adjust or renew as required.

YES

R Check Mechanism (5),(6),(7) or (8) for freedom from damage. If damaged, renew Mechanism (5),(6),(7) or (8).

Chart 104 (Sheet 3 of 3)

```
***********************
*RAMPS FAIL TO REACH  *
*FULLY RAISED         *
*POSITION.            *
***********************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
HYDRAULIC POWER SUPPLY	-
EQUIPMENT FOR ENTERING AND PROTECTING INTAKE INTERIOR	-
SUPPORT BLOCK	D925453000
SUPPORT BLOCK	D925453001

R NOTE: Before renewal of components (*), check the associated run
R of wiring for continuity.

```
 -----------       -----------       -----------          -----------
|Fully raise|     |Check ramps|     |Check, for |        |Renew or   |
|ramps,     |-----|reach fully|-YES-|freedom    |-YES-   |secure     |
|using      |     |raised     |     |from damage|        |linkage, as|
|alternative|     |position.  |     |and/or     |        |necessary. |
|hydraulic  |      -----------      |security,  |         -----------
|system to  |           |           |snubbing   |
|that in use|           NO          |device     |         -----------
|when fault |           |           |linkage of |        |Check over-|
|was found. |           |           |system in  |-NO--   |travel of  |
 -----------            |           |use when   |        |both       |
                        |           |fault was  |        |snubbing   |
                        |           |found.     |        |devices of |
                        |            -----------         |Actuator   |
                        |                                |(1),(2),(3)|
                   -----------       -----------         |or (4).    |
                  |Check      |-YES-|Renew      |         -----------
                  |screwjack  |     |screw-     |
                  |threads for|     |jack(s) of |
                  |discolour- |     |Actuator   |
                  |ation or   |     |(1),(2),(3)|
                  |damage     |     |or (4).    |
                  |(Ref.      |      -----------
                  |71-63-00,  |
                  |I/C).      |
                   -----------
                        |
                        NO
                        |
```

(Continued on Sheet 2)

Chart 105 (Sheet 1 of 2)

```
                                 |
                      (Continued from Sheet 1)
                                 |
                                 |
     ------------------------------        ------------------------------
    |Disconnect Actuator (1),(2),  |-YES-|*Renew Actuator (1),(2),(3)   |
    |(3) or (4) from mechanism.    |     |or (4).                       |
    |Check ramps can be fully      |      ------------------------------
    |raised manually.              |
     ------------------------------
               |
               NO
               |
     ------------------------------        ------------------------------
R   |Check Mechanism (5),(6),(7)   |-NO--|Renew Mechanism (5),(6),(7)   |
R   |or (8) for freedom from       |     |or (8).                       |
R   |damage.                       |      ------------------------------
     ------------------------------
               |
              YES
               |
     ------------------------------
    |Check rigging of Ramps (9),   |
    |(10), (11) or (12).           |
     ------------------------------
```

Chart 105 (Sheet 2 of 2)

```
***********************
*RAMPS FAIL TO REACH  *
*FULLY LOWERED        *
*POSITION.            *
***********************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
HYDRAULIC POWER SUPPLY	-
EQUIPMENT FOR ENTERING AND PROTECTING INTAKE INTERIOR	-
SUPPORT BLOCK	D925453000
SUPPORT BLOCK	D925453001

```
R  NOTE:  Before renewal of components (*), check the associated run
R         of wiring for continuity.

R   -----------         -----------         -----------         -----------
R  |Fully lower|       |Check ramps|       |Check, for |       |Renew or   |
R  |ramps,     |-----|reach fully|-YES-|freedom    |-YES-|secure     |
R  |using      |       |lowered    |       |from damage|       |linkage, as|
R  |alternative|       |position.  |       |and/or     |       |necessary. |
R  |hydraulic  |        -----------        |security,  |        -----------
R  |system to  |             |             |snubbing   |
R  |that in use|             NO            |device     |        -----------
R  |when fault |             |             |linkage of |       |Check over-|
R  |was found. |             |             |system in  |-NO--|travel of  |
R   -----------              |             |use when   |       |both       |
R                            |             |fault was  |       |snubbing   |
R                            |             |found.     |       |devices of |
R                            |              -----------        |Actuator   |
R                            |                                 |(1),(2),(3)|
                        -----------         -----------        |or (4).    |
R                      |Check      |-YES-|Renew      |        -----------
R                      |screwjack  |       |screw-     |
R                      |threads for|       |jack(s) of |
R                      |discolour- |       |Actuator   |
R                      |ation or   |       |(1),(2),(3)|
R                      |damage     |       |or (4).    |
R                      |(Ref.      |        -----------
R                      |71-63-00,  |
R                      |I/C).      |
                        -----------
                             |
                             NO
                             |
```

(Continued on Sheet 2)

Chart 106 (Sheet 1 of 2)

```
                                   |
                         (Continued from Sheet 1)
                                   |
                                   |
    ---------------------------           ------------------------------
    |Disconnect Actuator (1),(2), |-YES=|*Renew Actuator (1),(2),(3)   |
    |(3) or (4) from mechanism.   |     |or (4).                       |
    |Check ramps can be fully     |      ------------------------------
    |lowered manually.            |
    ---------------------------
                 |
                 NO
                 |
    ---------------------------           ------------------------------
R   |Check Mechanism (5),(6),(7)  |-NO--|Renew Mechanism (5),(6),(7)   |
R   |or (8) for freedom from      |     |or (8).                       |
R   |damage.                      |      ------------------------------
    ---------------------------
                 |
                 YES
                 |
    ---------------------------
    |Check rigging of Ramps (9),  |
    |(10), (11) or (12).          |
    ---------------------------
```

Chart 106 (Sheet 2 of 2)

*INDICATOR FAILS TO DISPLAY '0' OR '100' PER CENT WITH RAMPS FULLY RAISED OR FULLY LOWERED, AS APPROPRIATE.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TEST SET (RESOLVERS)	TE6049000
PINION WRENCH	F500/9
MULTIMETER	-

NOTE: Before renewal of components (*), check the associated run of wiring for continuity.

Using hydraulic power, operate associated spill door. Check spill door position indicator needle moves.

-YES- Connect test set to Resolver (13),(14),(15) or (16) (Ref. 71-63-14, A/T). Fully lower and fully raise ramps; check that test set readings decrease and increase accordingly.

-YES- Adjust as necessary, Resolver (13),(14),(15) or (16). Switch off and disconnect test set; reconnect electrical connector to resolver. If required, adjust trim potentiometer of Indicator (17),(18),(19) or (20). Is fault cleared?

NO

Check for indicator supply at pins A,B and C of connector K2030 A,B,C or D at panel 8-214.

YES

*Renew Indicator (17),(18),(19) or (20). Reconnect connector K2030 A,B,C or D.

NO (test set readings)

*Renew Resolver (13),(14),(15) or (16).

NO (needle) / NO (indicator supply)

(Continued on Sheet 2)

Chart 107 (Sheet 1 of 2)

(Continued from Sheet 1)

Check for 26 V a.c. output from CB (21),(22),(23) or (24).

-NO-- Renew CB (21),(22), (23) or (24).

YES

Locate and rectify O/C between CB (21),(22),(23) or (24) and appropriate terminal block:
UG4111, zone 411;
UG4144, zone 421;
UG4175, zone 431;
UG4206, zone 441.

Locate and rectify O/C between Resolver (13),(14), (15) or (16) and Indicator (17),(18),(19) or (20). Reconnect connector K2030 A, B,C or D at panel 8-214.

Chart 107 (Sheet 2 of 2)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(1) Ramps actuator	-	411	1K1702	No.1 intake roof	71-63-11 R/I and A/T	71-63-01
(2) Ramps actuator	-	421	2K1702	No.2 intake roof	71-63-11 R/I and A/T	71-63-01
(3) Ramps actuator	-	431	3K1702	No.3 intake roof	71-63-11 R/I and A/T	71-63-01
(4) Ramps actuator	-	441	4K1702	No.4 intake roof	71-63-11 R/I and A/T	71-63-01
(5) Torque tube mechanism	-	411	-	No.1 intake roof, sidewall and centre wall	71-63-13 R/I	-
(6) Torque tube mechanism	-	421	-	No.2 intake roof, sidewall and centre wall	71-63-13 R/I	-
(7) Torque tube mechanism	-	431	-	No.3 intake roof, sidewall and centre wall	71-63-13 R/I	-
(8) Torque tube mechanism	-	441	-	No.4 intake roof, sidewall and centre wall	71-63-13 R/I	-
(9) Front and rear ramps	-	411	-	No.1 intake roof	71-63-12 R/I and A/T	-

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(10) Front and rear ramps	-	421	-	No.2 intake roof	71-63-12 R/I and A/T	-
(11) Front and rear ramps	-	431	-	No.3 intake roof	71-63-12 R/I and A/T	-
(12) Front and rear ramps	-	441	-	No.4 intake roof	71-63-12 R/I and A/T	-
(13) Ramps position indicator resolver	-	411	1E542	No.1 intake, at front end of centre wall mechanism	71-63-14 R/I and A/T	71-63-02
(14) Ramps position indicator resolver	-	421	2E542	No.1 intake, at front end of centre wall mechanism	71-63-14 R/I and A/T	71-63-02
(15) Ramps position indicator resolver	-	431	3E542	No.3 intake, at front end of centre wall mechanism	71-63-14 R/I and A/T	71-63-02
(16) Ramps position indicator resolver	-	441	4E542	No.4 intake, at front end of centre wall mechanism	71-63-14 R/I and A/T	71-63-02
(17) No.1 intake ramps position indicator	-	8-214	K2030	Flight compartment	71-61-17 R/I	71-63-02
(18) No.2 intake ramps position indicator	-	8-214	K2030	Flight compartment	71-61-17 R/I	71-63-02

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(19) No.3 intake ramps position indicator	-	8-214	K2030	Flight compartment	71-61-17 R/I	71-63-02
(20) No.4 intake ramps position indicator	-	8-214	K2030	Flight compartment	71-61-17 R/I	71-63-02
(21) Circuit breaker 26 V	-	2-213	1E541	Map ref.E14	24-50-00 R/I	71-63-02
(22) Circuit breaker 26 V	-	4-213	2E541	Map ref.E17	24-50-00 R/I	71-63-02
(23) Circuit breaker 26 V	-	4-213	3E541	Map ref.F17	24-50-00 R/I	71-63-02
(24) Circuit breaker 26 V	-	2-213	4E541	Map ref.F14	24-50-00 R/I	71-63-02

Component Identification
Table 101

END OF THIS SECTION

NEXT

INTAKE SPILL DOOR ACTUATION - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. paras.3. to 8.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

R Further assumptions are that hydraulic power is available
R (Ref. Chap.29) and that the air intake control system (AICS) and inching facilities are serviceable.

In the interest of safety, all persons not connected with this trouble shooting must be excluded from inside all intakes and from the area in the immediate vicinity of all spill doors.

2. Preparation

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Angle indicator	D920327000
Stop watch	-

B. Prepare

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel to indicate that work is being carried out on the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the main system (green or blue) or to yellow (standby)

system as required in the particular test.

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

3. Trouble Shooting - Spill Door Operation Using Main Hydraulic System

```
A.*******************************************
  *Prepare to trouble shoot (Ref. para.2.).*
  *Attach angle indicator to spill door, at*
  *centre wall position, and adjoining     *
  *structure. Reset INT (1,2,3 or 4) MAIN  *
  *HYD SUP circuit breaker (Ref.para.2.B.  *
  *(6)), and remove locking pin from main  *
  *hydraulic system selector valve asso-   *
  *ciated with spill door under test.      *
  *Make available electrical ground power  *
  *as detailed in 24-41-00.                *
  *Remove anti-interference plate from     *
  *intake management panel.                *
  *Test as follows:                        *
  *Fully pressurize main hydraulic system. *
  *Hold SPILL switch at "SHUT" to fully    *
  *close door.  Record angle indicator     *
  *reading.  Move and hold SPILL switch at *
  *"OPEN" and check that door operates     *
  *smoothly and opens fully within 7.3 to  *
  *8.2 s. Check that angle indicator shows *
  *door has opened 37(±0.7) deg for intake *
  *2 or 3; 36.3(±0.7) deg for intake 1 or  *
  *4. Fully close door, checking that it   *
  *operates smoothly and is fully shut     *
  *within 10.2 to 11.8 s.                  *
  *Depressurize hydraulic system.          *
  ******************************************
             |    |
             |    |            ----------------------------------
             |    |           |1. Spill door fails to open, using|
             |    |           |   main hydraulic system -        |
             |    |           |   Chart 101.                     |
             OK   NOT OK------|2. Spill door fails to reach fully|
             |                |   open position - Chart 103.     |
             |                |3. Spill door fails to operate    |
             |                |   smoothly - Chart 104.          |
             |                |4. Spill door fails to open/close |
             |                |   within time limits - Chart 105.|
             |                |5. Spill door fails to close fully|
             |                |   - Chart 106.                   |
             |                 ----------------------------------
             |
```

B.***
*Switch off and disconnect electrical *
*ground power as detailed in 24-41-00. *
*Remove angle indicator and all other *
*tools and equipment. Ensure that intake *
*interiors are clear of debris and loose *
*objects. Set HYD switches to "AUTO". *
Set RAMP SPILL MASTER switches to "MAN".
Remove locking pins from selector valves
*of all intakes. Reset all circuit *
*breakers previously tripped. Refit *
*all access panels. *
****

4. Trouble Shooting - Spill Door Operation Using Standby Hydraulic System

A.***
Prepare to trouble shoot (Ref. para.2.).
Attach angle indicator to spill door, at
*centre wall position, and adjoining *
*structure. Reset INT (1,2,3 or 4) ST'BY *
*HYD SUP circuit breaker (Ref.para.2.B. *
*(6)), and remove locking pin from *
*standby hydraulic system selector valve *
*associated with spill door under test. *
*Make available electrical ground power *
*as detailed in 24-41-00. *
*Remove anti-interference plate from *
*intake management panel. *
*Test as follows: *
*Fully pressurize standby hydraulic *
*system. Hold SPILL switch at "SHUT" to *
fully close door. Record angle indicator
*reading. Move and hold SPILL switch at *
*"OPEN" and check that door operates *
*smoothly and opens fully within 7.3 to *
*8.2 s. Check that angle indicator shows *
*door has opened 37(±0.7) deg for intake *
*2 or 3; 36.3(±0.7) deg for intake 1 or *
*4. Fully close door, checking that it *
*operates smoothly and is fully shut *
*within 10.2 to 11.8 s. *
*Depressurize hydraulic system. *
****

```
                |      |
                |      |               |1. Spill door fails to open, using|
                |      |               |   standby hydraulic system -     |
                |      |               |   Chart 102.                     |
               OK    NOT OK-----------|2. Spill door fails to reach fully|
                |                      |   open position - Chart 103.     |
                |                      |3. Spill door fails to operate    |
                |                      |   smoothly - Chart 104.          |
                |                      |4. Spill door fails to open/close |
                |                      |   within time limits - Chart 105.|
                |                      |5. Spill door fails to close fully|
                |                      |   - Chart 106.                   |
                |                       ----------------------------------
                |
B.*******************************************
  *Switch off and disconnect electrical    *
  *ground power as detailed in 24-41-00.   *
  *Remove angle indicator and all other    *
  *tools and equipment. Ensure that intake *
  *interiors are clear of debris and loose *
  *objects.  Set HYD switches to "AUTO".   *
  *Set RAMP SPILL MASTER switches to "MAN".*
  *Remove locking pins from selector valves*
  *of all intakes.  Reset all circuit      *
  *breakers previously tripped.  Refit     *
  *all access panels.                      *
  ******************************************
```

5. Trouble Shooting - Spill Door Position Indicator System

```
A.*******************************************
  *Prepare to trouble shoot (Ref. para.2.).*
  *Attach angle indicator to spill door, at*
  *centre wall position, and adjoining     *
  *structure.  Reset INT (1,2,3 or 4) MAIN *
  *HYD SUP or INT (1,2,3 or 4) ST'BY HYD   *
  *SUP circuit breaker (Ref. para.2.B.(6)),*
  *and remove locking pin from appropriate *
  *main or standby hydraulic system        *
  *selector valve associated with spill    *
  *door under test.                        *
  *Make available electrical ground power  *
  *as detailed in 24-41-00.                *
  *Remove anti-interference plate from     *
  *intake management panel.                *
  *Test as follows:                        *
  *Fully pressurize hydraulic system. Hold *
  *SPILL inching switch at "SHUT"; check   *
  *that indicator displays 0 per cent, and *
  *record angle indicator reading. Hold    *
  *SPILL switch at "OPEN"; check that      *
  *indicator displays 100 per cent, and    *
  *that angle indicator shows door has     *
  *opened 37(±0.7) deg for intake 2 or 3;  *
  *36.3(±0.7) deg for intake 1 or 4. Hold  *
  *SPILL switch at "SHUT" until door is    *
  *fully closed; release switch.           *
  *Depressurize hydraulic system.          *
  ******************************************
            |    |
            |    |             ----------------------------------
            |    |            |1. Indicator fails to display 0 or|
           OK   NOT OK--------|   100 per cent with spill door   |
            |                 |   fully open or closed, as       |
            |                 |   appropriate - Chart 107.       |
            |                 |2. Spill door fails to reach fully|
            |                 |   open position - Chart 103.     |
            |                 |3. Spill door fails to close fully|
            |                 |   - Chart 106.                   |
            |                  ----------------------------------
            |
```


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```
B.****************************************
  *Switch off and disconnect electrical    *
  *ground power as detailed in 24-41-00.   *
  *Remove angle indicator and all other    *
  *tools and equipment.  Ensure that intake*
  *interiors are clear of debris and loose *
  *objects.  Set HYD switches to "AUTO".   *
  *Set RAMP/SPILL MASTER switches to "MAN".*
  *Remove locking pins from selector valves*
  *of all intakes.  Reset all circuit      *
  *breakers previously tripped.  Refit all *
  *access panels.                          *
  ****************************************
```

6. Trouble Shooting - Vane Operation

```
A.****************************************
  *Prepare to trouble shoot (Ref. para.2.).*
  *Ensure that spill door is fully closed  *
  *and supported.  Attach angle indicator  *
  *to spill door structure and on fore-and-*
  *aft centre line of vane.                *
  *Test as follows:                        *
  *Press down on vane; record angle        *
  *indicator reading, and check that       *
  *external skin of vane is flush with     *
  *surrounding external skin of spill door.*
  *Using a push-pull gauge applied at      *
  *centre of rear edge of vane, push vane  *
  *upward (vane opening); check that load  *
  *required to just move vane to fully     *
  *open position does not exceed 85 lbf    *
  *(378.10 N). Ensure that vane is fully   *
  *open; check that angle indicator reading*
  *shows vane has opened 31(±0.25) deg for *
  *intake 1,2 and 3 or, 25(±0.25) deg for  *
  *intake 4. Reverse direction of push     *
  *(vane closing), through push-pull gauge;*
  *check that load required to just move   *
  *vane to fully closed position does not  *
  *exceed 35 lbf (155.70 N).               *
  ****************************************
```

```
     |     |
     |     |
     |     |        ----------------------------------
     |     |       |1. Vane/spill door external skins |
     OK    NOT OK--|   not flush. Adjust downstops    |
     |             |   (Ref. 71-64-12, A/T). Check,   |
     |             |   and if necessary adjust, vane  |
R    |             |   position Microswitch (25)/(26),|
R    |             |   (27)/(28), (29)/(30) or        |
R    |             |   (31)/(32).                     |
     |             |2. Excessive load required to     |
     |             |   open/close vane - Chart 108.   |
     |             |3. Vane does not open required    |
     |             |   amount - Chart 109.            |
     |              ----------------------------------
     |
B.*******************************************
 *Remove angle indicator and all other     *
 *tools and equipment. Ensure that intake*
 *interiors are clear of debris and loose *
 *objects. Set HYD switches to "AUTO".     *
 *Set RAMP/SPILL MASTER switches to "MAN".*
 *Remove locking pins from selector valves*
 *of all intakes. Reset all circuit        *
 *breakers previously tripped. Refit all *
 *access panels.                           *
 *******************************************
```

R 7. Trouble Shooting - Vane Position Indication System

A. *Prepare to trouble shoot (Ref. para.2.).
*Ensure spill door is fully closed and supported.
*Make available electrical ground power as detailed in 24-41-00.
*Test as follows:
*Press down on vane and check associated indicator displays SHUT. Slowly open vane, checking indicator displays diagonal stripes and then OPEN when vane is fully open. Slowly close vane, checking indicator displays diagonal stripes and then SHUT when vane is fully closed.

OK

NOT OK

1. Indicator fails to display SHUT with vane fully closed - Chart 110.
2. Indicator fails to display OPEN with vane fully open - Chart 111.
3. Indicator displays SHUT instead of diagonal stripes. Adjust or
R renew Microswitch (26),(28),
R (30) or (32). If fault not rectified, renew auto control panel (Ref. 71-61-16, R/I).
4. Indicator displays OPEN instead of diagonal stripes. Adjust or
R renew Microswitch (25),(27),
R (29) or (31). If fault not rectified, renew auto control panel (Ref. 71-61-16, R/I).

B.***
*Switch off and disconnect electrical *
*ground power as detailed in 24-41-00. *
*Remove all tools and equipment. Ensure *
*that intake interiors are clear of *
*debris and loose objects. Set HYD *
*switches to "AUTO". Set RAMP/SPILL *
*MASTER switches to "MAN". Remove *
locking pins from selector valves of all
*intakes. Reset all circuit breakers *
*previously tripped. Refit all access *
*panels. *
****

SPILL DOOR FAILS TO OPEN, USING MAIN HYDRAULIC SYSTEM

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
HYDRAULIC GROUND POWER SUPPLY	-
SUPPORT FOR SPILL DOOR	-
EQUIPMENT FOR ENTERING AND PROTECTING INTAKE INTERIOR	-

NOTE: Before renewal of components (*), check the associated run of wiring for continuity.

```
-----------                                                     ----------
|Repeat test|       -----------                                |Check the  |
|but use    |------|Check spill|                               |electrical |
|standby    |      |door opens.|-YES---------------------------|control of |
|hydraulic  |       -----------                                |spill door |
|system     |            |                                     |main       |
|(Ref. para.|            NO                                    |hydraulic  |
|4.A.).     |            |                                     |system     |
 -----------   ----------------------------                    |(Ref.      |
              |*Renew electro-hydraulic unit|                  |71-00-39,  |
              |of Actuator (1),(2),(3) or   |                  |T/S).      |
              |(4).  Is fault cleared?      |                   ----------
               ----------------------------
                         |
                         NO
                         |
               ----------------------------                     ----------
              |Support door. Disconnect     |                  |*Renew     |
              |piston of Actuator (1),(2),  |-YES-             |Actuator   |
              |(3) or (4) from mechanism.   |                  |(1),(2),(3)|
              |Check door can be opened,    |                  |or (4).    |
              |manually.                    |                   ----------
               ----------------------------
 -----------             |
|Check for  |            |                                      ----------
|correct    |            NO                                    |Renew      |
|clearances |            |                                     |damaged    |
|in         |  ----------------------------                    |parts of   |
|Mechanism  |-NO--|Check for damage to Mechanism|-YES-          |Mechanism  |
|(5),(6),(7)|     |(5),(6),(7), or (8).         |               |(5),(6),(7)|
|or (8).    |      ----------------------------                 |or (8).    |
 -----------                                                    ----------
```

Chart 101

SPILL DOOR FAILS TO OPEN, USING STANDBY HYDRAULIC SYSTEM

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
HYDRAULIC GROUND POWER SUPPLY	-
SUPPORT FOR SPILL DOOR	-
EQUIPMENT FOR ENTERING AND PROTECTING INTAKE INTERIOR	-

NOTE: Before renewal of components (*), check the associated run of wiring for continuity.

Repeat test but use main hydraulic system (Ref. para. 3.A.). ----- Check spill door opens. -YES- Check the electrical control of spill door standby hydraulic system (Ref. 71-00-39, T/S).

NO

*Renew electro-hydraulic unit of Actuator (1),(2),(3) or (4). Is fault cleared?

NO

Support door. Disconnect piston of Actuator (1),(2),(3) or (4) from mechanism. Check door can be opened, manually. -YES- *Renew Actuator (1),(2),(3) or (4).

NO

Check for damage to Mechanism (5),(6),(7), or (8). -YES- Renew damaged parts of Mechanism (5),(6),(7) or (8).

-NO- Check for correct clearances in Mechanism (5),(6),(7) or (8).

Chart 102

SPILL DOOR FAILS TO REACH FULLY OPEN POSITION.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
HYDRAULIC POWER SUPPLY	-
SUPPORT FOR SPILL DOOR	-
EQUIPMENT FOR ENTERING AND PROTECTING INTAKE INTERIOR	-

NOTE: Before renewal of components (*), check the associated run of wiring for continuity.

Using hydraulic power, inch door open as far as possible; support door. Disconnect piston of Actuator (1),(2),(3) or (4) from mechanism

Check door can be fully opened, manually.
- YES: *Renew Actuator (1),(2),(3) or (4).
- NO: Check for damage to Mechanism (5),(6),(7) or (8).
  - YES: Renew damaged parts of Mechanism (5),(6),(7) or (8).
  - NO: Check for correct clearances in Mechanism (5),(6),(7) or (8).
    - YES: Check spill door rigging (Ref. 71-64-12, A/T).

Chart 103

```
*********************
*SPILL DOOR FAILS TO*
*OPERATE SMOOTHLY.  *
*********************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
HYDRAULIC GROUND POWER SUPPLY	-
SUPPORT FOR SPILL DOOR	-
EQUIPMENT FOR ENTERING AND PROTECTING INTAKE INTERIOR	-

NOTE: Before renewal of components (*), check the associated run of wiring for continuity.

```
 -----------      -----------                          -----------
|Operate    |    |Repeat test|                        |Check the  |
|door       |-NO--|using      |-YES-------------------|electrical |
|through    |    |alternative|                        |control of |
|fully open/|    |system to  |                        |spill door |
|close cycle|    |that in use|                        |hydraulic  |
|several    |    |when fault |                        |system in  |
|times,using|    |was found. |                        |use when   |
|hydraulic  |    |Check door |                        |fault was  |
|system in  |    |operates   |                        |found (Ref.|
|use when   |    |smoothly.  |                        |71-00-39,  |
|fault was  |     -----------                         |T/S).      |
|found.Check|          |                               -----------
|door       |          NO
|operates   |          |
|smoothly.  |          |
 -----------      ---------------------------
                 |*Renew electro-hydraulic unit|
                 |of Actuator (1),(2),(3) or   |
                 |(4). Is fault cleared?       |
                  ---------------------------
                           |
                           NO
                           |
```

(Continued on Sheet 2)

Chart 104 (Sheet 1 of 2)

(Continued from Sheet 1)

```
                                         |
                                 ----------------------------          -----------
                                |Fully open door; position   |        |*Renew     |
                                |support. Disconnect piston of|-YES-  |Actuator   |
                                |Actuator (1),(2),(3) or (4) |        |(1),(2),(3)|
                                |from mechanism. Open and    |        |or (4).    |
                                |close door, manually; check |         -----------
  -----------                   |for smooth operation.       |
 |Check for  |                   ----------------------------          -----------
 |correct    |                               |                      |Renew      |
 |clearances |                               NO                     |damaged    |
 |in         |                               |                      |parts of   |
 |Mechanism  |                   ----------------------------       |Mechanism  |
 |(5),(6),(7)|-NO--|Check for damage to Mechanism|-YES-             |(5),(6),(7)|
 |or (8).    |     |(5),(6),(7) or (8).          |                  |or (8).    |
  -----------       ----------------------------                     -----------
```

Chart 104 (Sheet 2 of 2)

SPILL DOOR FAILS TO OPEN/SHUT WITHIN TIME LIMITS.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
HYDRAULIC GROUND POWER SUPPLY	-
SUPPORT FOR SPILL DOOR	-
EQUIPMENT FOR ENTERING AND PROTECTING INTAKE INTERIOR	-

NOTE: Before renewal of components (*), check the associated run of wiring for continuity.

Operate door fully open and fully closed in turn, using alternative hydraulic system to that in use when fault was found.

Check door operates within time limits.

- YES — Adjust manual rate setting potentiometers (Ref. 71-61-00, A/T) of system in use when fault was found. Is fault cleared?
  - NO — Check the electrical control of spill door hydraulic system in use when fault was found (Ref. 71-00-39, T/S).
- NO — *Renew electro-hydraulic unit of Actuator (1),(2),(3) or (4). Is fault cleared?
  - NO

(Continued on Sheet 2)

Chart 105 (Sheet 1 of 2)

```
                              (Continued from Sheet 1)
                                      |
                              ----------------------------          -----------
                             |Fully open door; position    |        |*Renew     |
                             |support. Disconnect piston of|-YES-  |Actuator   |
                             |Actuator (1),(2),(3) or (4)  |        |(1),(2),(3)|
                             |from mechanism. Check door,  |        |or (4).    |
                             |manually, for free movement. |         -----------
 -----------                  ----------------------------
|Check for  |                             |                          -----------
|correct    |                             |                         |Renew      |
|clearances |                             NO                        |damaged    |
|in         |                             |                         |parts of   |
|Mechanism  |                  ----------------------------         |Mechanism  |
|(5),(6),(7)|-NO--|Check for damage to Mechanism|-YES-|(5),(6),(7)|
|or (8).    |     |(5),(6),(7) or (8).          |     |or (8).    |
 -----------                  ----------------------------           -----------
```

Chart 105 (Sheet 2 of 2)

```
*********************
*SPILL DOOR FAILS   *
*TO CLOSE FULLY.    *
*********************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
HYDRAULIC POWER SUPPLY	-
SUPPORT FOR SPILL DOOR	-
EQUIPMENT FOR ENTERING AND PROTECTING INTAKE INTERIOR	-

NOTE: Before renewal of components (*), check the associated run of wiring for continuity.

```
 -----------      -----------                           -----------
|Using      |    |Check      |                         |Repair or  |
|hydraulic  |----|nacelle for|-YES---------------------|renew as   |
|power, open|    |damage in  |                         |necessary. |
|spill door |    |area around|                          -----------
|50 per cent|    |door.      |
|(approx.). |     -----------
 -----------           |
                       NO
                       |
                  -----------                           -----------
                 |Check for  |                         |Renew      |
                 |damage to  |-YES---------------------|damaged    |
                 |Mechanism  |                         |parts of   |
                 |(5),(6),(7)|                         |Mechanism  |
                 |or (8).    |                         |(5),(6),(7)|
                  -----------                          |or (8).    |
                       |                                -----------
                       NO
                       |
 -----------      ---------------------------           -----------
|Check spill|    |Fully open door and position |       |*Renew     |
|door       |-NO-|support. Disconnect piston of|-YES-  |Actuator   |
|rigging    |    |Actuator (1),(2),(3) or (4)  |       |(1),(2),(3)|
|(Ref.      |    |from mechanism, Check door   |       |or (4).    |
|71-64-12,  |    |can be fully closed,         |        -----------
|A/T).      |    |manually.                    |
 -----------      ---------------------------
```

Chart 106

INDICATOR FAILS TO DISPLAY '0' or '100' PER CENT WITH SPILL DOOR FULLY CLOSED OR FULLY OPEN, AS APPROPRIATE.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TEST SET (RESOLVERS)	TE6049000
PINION WRENCH	F500/9
MULTIMETER	-

NOTE: Before renewal of components (*), check the associated run of wiring for continuity.

Using hydraulic power, operate associated ramps. Check ramps position indicator needle moves.

-YES- Connect test set to Resolver (9),(10), (11) or (12) (Ref. 71-64-16, A/T). Fully lower and fully raise spill door; check that test set readings decrease and increase accordingly

-YES- Adjust as necessary, Resolver (9),(10), (11) or (12). Switch off and disconnect test set; reconnect electrical connector to resolver. If required, adjust trim potentiometers of Indicator (13),(14), (15) or (16) (Ref. 71-64-16, A/T). Is fault cleared?

-NO- Check for indicator supply between pins P and a, and N and a of connector K2030 A,B,C or D at panel 8-214.

---YES

NO: Locate and rectify O/C between Resolver (9),(10), (11) or (12) and Indicator (13),(14), (15) or (16). Reconnect connector K2030 A,B, C or D.

NO (test set readings): *Renew Resolver (9), (10), (11) or (12).

NO (ramps position indicator needle moves)

(Continued on Sheet 2)

Chart 107 (Sheet 1 of 2)

```
      |                (Continued from Sheet 1)           |
      |                                                   |
 -------------        -----------------------------       |
|Check for    |-NO-|Renew CB (17),(18),(19), or |         |
|26 V a.c.    |    |(20).                        |        |
|output from  |     -----------------------------         |
|CB (17),(18),|                                           |
|(19) or (20).|                                           |
 -------------                                            |
      |
     YES
      |
 -----------------------------                            |    -----------
|Locate and rectify O/C       |                           |   |*Renew     |
|between CB (17),(18),(19) or |                           --  |manual     |
|(20) and appropriate terminal|                               |control    |
|block:                       |                               |panel (Ref.|
|UG4111, zone 411;            |                               |71-61-22,  |
|UG4144, zone 421;            |                               |R/I).      |
|UG4175, zone 431;            |                                -----------
|UG4206, zone 441.            |
 -----------------------------
```

Chart 107 (Sheet 2 of 2)

****
*EXCESSIVE LOAD REQUIRED *
*TO OPEN/CLOSE VANE. *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
HYDRAULIC POWER SUPPLY	-

Using hydraulic power, open spill door 50 per cent (approx.).

Check for correct oil content in both dampers in spill door

-NO- Renew Damper(s) (21),(22), (23) or (24).

YES

Disconnect pistons of both Dampers (21),(22),(23) or
R (24) from idler levers.
R Check vane operates freely
R and smoothly.
R

-YES- Renew Damper(s) (21),(22), (23) or (24).

NO

Check vane and spill door for damage. Repair or renew as necessary.

Chart 108

```
   ************************          ------------------------------------
   *VANE DOES NOT OPEN    *         |GROUND EQUIPMENT REQUIRED           |
   *REQUIRED AMOUNT.      *         |------------------------------------|
   ************************         |DESCRIPTION              PART NO.   |
                                    |------------------------------------|
                                    |GROUND POWER SUPPLY      -          |
                                    |HYDRAULIC POWER SUPPLY   -          |
                                    |ANGLE INDICATOR          D920327000 |
                                     ------------------------------------

     -----------          -----------------------------         -----------
    |Attach     |        |Record angle indicator read- |       |Renew dis- |
    |angle indi-|--------|ing. Disconnect piston of one|-YES-  |connected  |
R   |cator to   |        |damper from idler lever.     |       |Damper     |
R   |fore-and-  |        |Fully open vane; check angle |       |(21),(22), |
R   |aft centre |        |indicator shows vane has     |       |(23) or    |
    |line of    |        |opened required amount.      |       |(24).      |
R   |vane, and  |         -----------------------------         -----------
R   |to spill   |                      |
    |door struc-|                      |
    |ture. Using|                      NO
    |hydraulic  |                      |
    |power, open|         -----------------------------         -----------
    |door 50 per|        |Fully close vane. Record     |       |Renew      |
    |cent       |        |angle indicator reading. Dis-|-YES-  |Damper     |
    |(approx.). |        |connect piston of other      |       |(21),(22), |
R    -----------         |damper from idler lever.     |       |(23) or    |
R                        |Check vane can be opened     |       |(24).      |
R                        |freely to required amount.   |        -----------
                          -----------------------------
                                       |
                                       NO
                                       |
R                         -----------------------------
R                        |Check vane rigging (Ref.     |
                         |71-64-12, A/T).              |
                          -----------------------------
```

Chart 109

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```
*******************************
*INDICATOR FAILS TO DISPLAY   *
*'SHUT' WITH VANE FULLY CLOSED*
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

<u>NOTE</u>: Before renewal of components (*), check the associated run of wiring for continuity.

```
   -----------                            -----------        -----------
  |Depress    |                          |Depress    |-YES-|Adjust     |
  |vane 'open'|-YES----------------------|vane       |     |Microswitch|
R |Microswitch|                          |'closed'   |     |(26),(28), |
R |(25),(27), |                          |Microswitch|     |(30) or    |
R |(29) or    |                          |(26),(28)  |     |(32).      |
R |(31). Check|                          |(30) or    |      -----------
R |indicator  |                          |(32). Check|
  |displays   |                          |indicator  |
  |OPEN.      |                          |displays   |
   -----------                           |SHUT.      |
        |                                 -----------
        NO                                     |
        |                                      NO
   -----------       -----------               |
  |Check for  |     |Renew CB   |         -----------        -----------
R |28 V output|-NO--|(37),(38), |        |Link term- |       |*Renew     |
R |from CB    |     |(39) or    |        |inals B5/B1|-YES-|Microswitch|
R |(37),(38), |     |(40).      |        |of approp- |     |(26),(28), |
R |(39) or    |      -----------         |riate term-|     |(30) or    |
R |(40).      |                          |inal block:|     |(32).      |
   -----------                           |UG4213,zone|      -----------
        |                                |411;       |
        YES                              |UG4217,zone|
        |                                |421;       |
   -----------                           |UG4221,zone|
  |*Renew auto|                          |431;       |
  |control    |                          |UG4225,zone|
  |panel (Ref.|                          |441.       |
  |71-61-16,  |                          |Check indi-|
  |R/I).      |                          |cator dis- |
   -----------                           |plays SHUT.|
                                          -----------
                                               |
                                               NO
                                    (Continued on Sheet 2)
```

Chart 110 (Sheet 1 of 2)

(Continued from Sheet 1)

Check for earth potential at pin v of connector K2035 A, B, C or D at panel 8-214.

-NO-- Locate and rectify O/C between pin v of connector K2035 A, B, C or D and terminal B5. Remove link, remake terminal connections and connect connector K2035 A, B, C, or (D).

YES

R R R Check for earth potential at Indicator (33), (34), (35), or (36).

-NO-- Locate and rectify O/C at AUTO panel. Remove link and connect connector K2035 A, B, C, or D.

YES

*Renew auto control panel (Ref. 71-61-16, R/I). Remove link and connect connector K2035 A, B, C or D.

Chart 110 (Sheet 2 of 2)

```
********************************     -------------------------------
*INDICATOR FAILS TO DISPLAY   *     |GROUND EQUIPMENT REQUIRED      |
*'OPEN' WITH VANE FULLY OPEN. *     |-------------------------------|
********************************     |DESCRIPTION          PART NO. |
                                     |-------------------------------|
                                     |GROUND POWER SUPPLY   -        |
                                     |MULTIMETER            -        |
                                      -------------------------------
```

NOTE: Before renewal of components (*), check the associated run of wiring for continuity.

```
      -----------                                  -----------       -----------
     |Depress    |                                |Depress    |-YES-|Adjust     |
     |vane       |-YES----------------------------|vane       |     |Microswitch|
R    |'closed'   |                                |'open'     |     |(25),(27), |
R    |Microswitch|                                |Microswitch|     |(29) or    |
R    |(26),(28), |                                |(25),(27), |     |(31).      |
R    |(30) or    |                                |(29) or    |      -----------
R    |(32). Check|                                |(31). Check|
     |indicator  |                                |indicator  |
     |displays   |                                |displays   |
     |SHUT.      |                                |OPEN.      |
      -----------                                  -----------
           |                                            |
           NO                                           NO
           |                                            |
      -----------           -----------            -----------             -----------
     |Check for  |         |Renew CB   |          |Link term- |           |*Renew     |
R    |28 V output|-NO--    |(37),(38), |          |inals A5/B2|           |Microswitch|
R    |from CB    |         |(39) or    |          |of approp- |-YES-      |(25),(27), |
R    |(37),(38), |         |(40).      |          |riate term-|           |(29) or    |
R    |(39) or    |          -----------           |inal block:|           |(31).      |
R    |(40).      |                                |UG4213,zone|            -----------
      -----------                                 |411;       |
           |                                      |UG4217,zone|
           YES                                    |421;       |
           |                                      |UG4221,zone|
      -----------                                 |431;       |
     |*Renew auto|                                |UG4225,zone|
     |control    |                                |441.       |
     |panel (Ref.|                                |Check indi-|
     |71-61-16,  |                                |cator dis- |
     |R/I).      |                                |plays OPEN.|
      -----------                                  -----------
                                                        |
                                                        NO
```

(Continued on Sheet 2)

Chart 111 (Sheet 1 of 2)

(Continued from Sheet 1)

Check for earth potential at pin w of connector K2035 A, B, C or D at panel 8-214.

-NO-- Locate and rectify O/C between pin w of connector K2035 A, B, C or D and terminal A5. Remove link, remake terminal connections and connect connector K2035 A, B, C, or (D).

YES

R
R
R
Check for earth potential at Indicator (33), (34),(35), or (36).

-NO-- Locate and rectify O/C at AUTO panel. Remove link and connect connector K2035 A, B, C, or D.

YES

*Renew auto control panel (Ref. 71-61-16, R/I). Remove link and connect connector K2035 A,B,C or D.

Chart 111 (Sheet 2 of 2)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(1) Spill door actuator	HL	411	1K1705	No.1 intake sidewall	71-64-11 R/I and A/T	71-64-01
(2) Spill door actuator	HR	421	2K1705	No.2 intake sidewall	71-64-11 R/I and A/T	71-64-01
(3) Spill door actuator	HL	431	3K1705	No.3 intake sidewall	71-64-11 R/I and A/T	71-64-01
(4) Spill door actuator	HR	441	4K1705	No.4 intake sidewall	71-64-11 R/I and A/T	71-64-01
(5) Mechanism (renewal and clearances)	HL	411	-	No.1 intake sidewall and centre wall	71-64-14 R/I	-
(6) Mechanism (renewal and clearances)	HR	421	-	No.2 intake sidewall and centre wall	71-64-14 R/I	-
(7) Mechanism (renewal and clearances)	HL	431	-	No.3 intake sidewall and centre wall	71-64-14 R/I	-
(8) Mechanism (renewal and clearances)	HR	441	-	No.4 intake sidewall and centre wall	71-64-14 R/I	-
(9) Spill door position resolver	FB	411	1E543	No.1 intake centre wall, hinge end of spill door	71-64-16 R/I and A/T	71-64-02

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(10) Spill door position resolver	FB	421	2E543	No.2 intake centre wall, hinge end of spill door	71-64-16 R/I and A/T	71-64-02
(11) Spill door position resolver	FB	431	3E543	No.3 intake centre wall, hinge end of spill door	71-64-16 R/I and A/T	71-64-02
(12) Spill door position resolver	FB	441	4E543	No.4 intake centre wall, hinge end of spill door	71-64-16 R/I and A/T	71-64-02
(13) No.1 intake spill door position indicator	-	8-214	K2030	3CM station	71-61-22 R/I	71-64-02
(14) No.2 intake spill door position indicator	-	8-214	K2030	3CM station	71-61-22 R/I	71-64-02
(15) No.3 intake spill door position indicator	-	8-214	K2030	3CM station	71-61-22 R/I	71-64-02
(16) No.4 intake spill door position indicator	-	8-214	K2030	3CM station	71-61-22 R/I	71-64-02
(17) Circuit breaker 26 V	-	2-213	1E541	Map ref.E14	24-50-00 R/I	71-64-02
(18) Circuit breaker 26 V	-	4-213	2E541	Map ref.E17	24-50-00 R/I	71-64-02

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(19) Circuit breaker 26 V	-	4-213	3E541	Map ref.F17	24-50-00 R/I	71-64-02
(20) Circuit breaker 26 V	-	2-213	4E541	Map ref.F14	24-50-00 R/I	71-64-02
(21) Vane damper(s)	-	411	-	In No.1 intake spill door boxes	71-64-12 R/I and A/T	-
(22) Vane damper(s)	-	421	- -	In No.2 intake spill door boxes	71-64-12 R/I and A/T	-
(23) Vane damper(s)	-	431	-	In No.3 intake spill door boxes	71-64-12 R/I and A/T	-
(24) Vane damper(s)	-	441	-	In No.4 intake spill door boxes	71-64-12 R/I and A/T	-
(25) Vane 'open' position microswitch	GB	411	1E533	Centre, hinge end of No.1 intake spill door	71-64-15 R/I and A/T	71-64-31
(26) Vane 'closed' position microswitch	GB	411	1E532	Centre, hinge end of No.1 intake spill door	71-64-15 R/I and A/T	71-64-31
(27) Vane 'open' position microswitch	GB	421	2E533	Centre, hinge end of No.2 intake spill door	71-64-15 R/I and A/T	71-64-31

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(28) Vane 'closed' position microswitch	GB	421	2E532	Centre, hinge end of No.2 intake spill door	71-64-15 R/I and A/T	71-64-31
(29) Vane 'open' position microswitch	GB	431	3E533	Centre, hinge end of No.3 intake spill door	71-64-15 R/I and A/T	71-64-31
(30) Vane 'closed' position microswitch	GB	431	3E532	Centre, hinge end of No.3 intake spill door	71-64-15 R/I and A/T	71-64-31
(31) Vane 'open' position microswitch	GB	441	4E533	Centre, hinge end of No.4 intake spill door	71-64-15 R/I and A/T	71-64-31
(32) Vane 'closed' position microswitch	GB	441	4E532	Centre, hinge end of No.4 intake spill door	71-64-15 R/I and A/T	71-64-31
(33) No.1 intake vane position indicator	-	8-214	K2035	3CM station	71-61-16 R/I	71-64-31
(34) No.2 intake vane position indicator	-	8-214	K2035	3CM station	71-61-16 R/I	71-64-31
(35) No.3 intake vane position indicator	-	8-214	K2035	3CM station	71-61-16 R/I	71-64-31

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(36) No.4 intake vane position indicator	-	8-214	K2035	3CM station	71-61-16 R/I	71-64-31
(37) Circuit breaker 28 V	-	5-213	1E531	Map ref.C6	24-50-00 R/I	71-60-03
(38) Circuit breaker 28 V	-	5-213	2E531	Map ref.F9	24-50-00 R/I	71-60-03
(39) Circuit breaker 28 V	-	1-213	3E531	Map ref.G9	24-50-00 R/I	71-60-03
(40) Circuit breaker 28 V	-	1-213	4E531	Map ref.C7	24-50-00 R/I	71-60-03

Component Identification
Table 101

OIL CONTENTS - TROUBLE SHOOTING

1. General

A. Oil is scavenged from the main bearing compartments and gearboxes and with the exception of oil from the right-hand gearbox is returned to the oil tank via the fuel cooled oil cooler. Oil from the right-hand gearbox is returned direct to the tank.

The oil tank incorporates an oil/air separator, a negative G ball valve and normally carries 13 litres of oil. When the engine is running the oil tank is pressurized to a differential pressure of 4 plus or minus 1/2 psi, this pressure being controlled by the oil tank vent valve.

There is a deviation in oil tank contents when the engine is static and when it is running. The deviation of approximately 1.5 to 2 litres is downward during engine start and upward during engine shut-down.

B. When the engine is static, oil is prevented from draining into the gearbox by an anti-drain system in which the anti drain tube connects the oil supply and oil return tubes. Should oil drain into the gearbox it is indicative of the anti-drain tube being blocked.

C. Some oil loss will occur if the system is subjected to negative G conditions. Should the oil loss appear excessive on any one engine in relationship to the other three engines, the negative G ball valve should be inspected on the suspect engine.

D. Normal oil drainage from the right-hand gearbox is approximately 1.3 litres and from the left-hand gearbox, approximately 1.0 litre. Excessive drainage from the right-hand gearbox together with a high oil consumption is probably due to either a blocked scavenge filter or a failed scavenge pump in the gearbox.

E. Should oil be discharged from the LP and HP turbines vents, the bearing pressurization ducts should be checked for severe leakage or restriction. If oil is discharged from the LP and HP turbine bearings cold vents only during engine run-down it is probably due to sticking of the oil pump check valve.

F. Where a defect is proved to be in the basic oil or lubrication systems, the spectrometric oil analysis and magnetic plug records should whenever possible be

examined, as they may provide assistance in locating or comfirming the specified defect.

G. Contamination of filters and magmetic plugs will fall into three categories i.e. normal, above normal but considered satisfactory for further flight with additional monitoring as considered necessary, and sufficient contamination to warrant rectification action before further flight.

NOTE: There is also a magnetic plug permanently housed in the Air Turbine Starter Unit which shares its oil supply with the engine (80-11-11).

When contamination in the last category is encountered, and is considered safe and unlikely to cause further engine damage, the following should be considered: installing clean filters and magnetic plugs, and carry out an engine run to establish the section of engine in which the debris is being generated. Information from this check may lead to a simple module change instead of a complete engine strip.

Carbon is known to build up in service around the No.4 bearing housing but due to frequent engine operation the carbon remains soft and intact. When an engine is removed and is allowed to stand for a period of time the carbon hardens and becomes brittle. Subsequent engine running causes the carbon to crack and to be released into the oil scavenge system.

If any filters are found to be blocked with carbon they must be cleaned and replaced.

An engine run must then be carried out and the filters rechecked. If they still show contamination the clean/ replace/engine run/re-check cycle must be repeated until such time that no carbon is found.

Action

When troubleshooting problems such as

a) high oil consumption

b) low oil pressure

B c) fluctuating oil pressure

B the following, amended. troubleshooting charts are to be
B used:-

B 71-00-43 Chart 108 - low oil tank contents indication HOC

B NOTE: Where problem is solely one of HOC, i.e. not just a
B pressure problem, troubleshooting in 72-01-00 Page
B Block 101 is recommeded.

H. The oil contents indication system basically consists of a transmitter and indiator incorporating two independent circuits, one to provide indication and one to activate an overfull warning light.

A magnetic dipstick is incorporated in the transmitter. The dipstick can be utilized to cross check the indicator reading but it should be noted that the dipstick is located by the same float which operates the read switches in the transmitter. The illustration (Ref. Fig. 101) shows the relationship between indicator and dipstick at varying oil contents. Probable defects in the indication system are covered in the trouble shooting charts 101 to 108 with the exception of the transmitter defects given subsequently.

A reed switch failing in the OPEN position will result in correct indication above and below the failed switch. With the oil contents at the failed switch position, the indicator pirnter will move to full scale deflection.

The 'shorting out' of a resistor in the network will result in correct indication up to the 'shorted' resistor, thereafter the indication will read low by approximately 0.8 litres.

J. Any investigation into increased or high engine oil consumption should include Engine Anti-Icing - Trouble Shooting (71-00-22), Engine Drains Trouble Shooting (71-00-24) and High Oil Consumption - Trouble Shooting (71-00-58).

K. Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is detailed in Table 101.

2. Preparation

WARNING: COMPLY WITH ELECTRICAL SAFETY PRECAUTION DETAILED IN 24-00-00.

A. Ensure that external electrical power supply is connected and switched on.

B. Consult chart 101 and carry out actions indicated to determine which of the trouble shooting charts is applicable.

3. Restore to Flight Standard

A. Complete and check any necessary rectification.

B. Reconnect all points where disconnection has been made during check and rectification procedures.

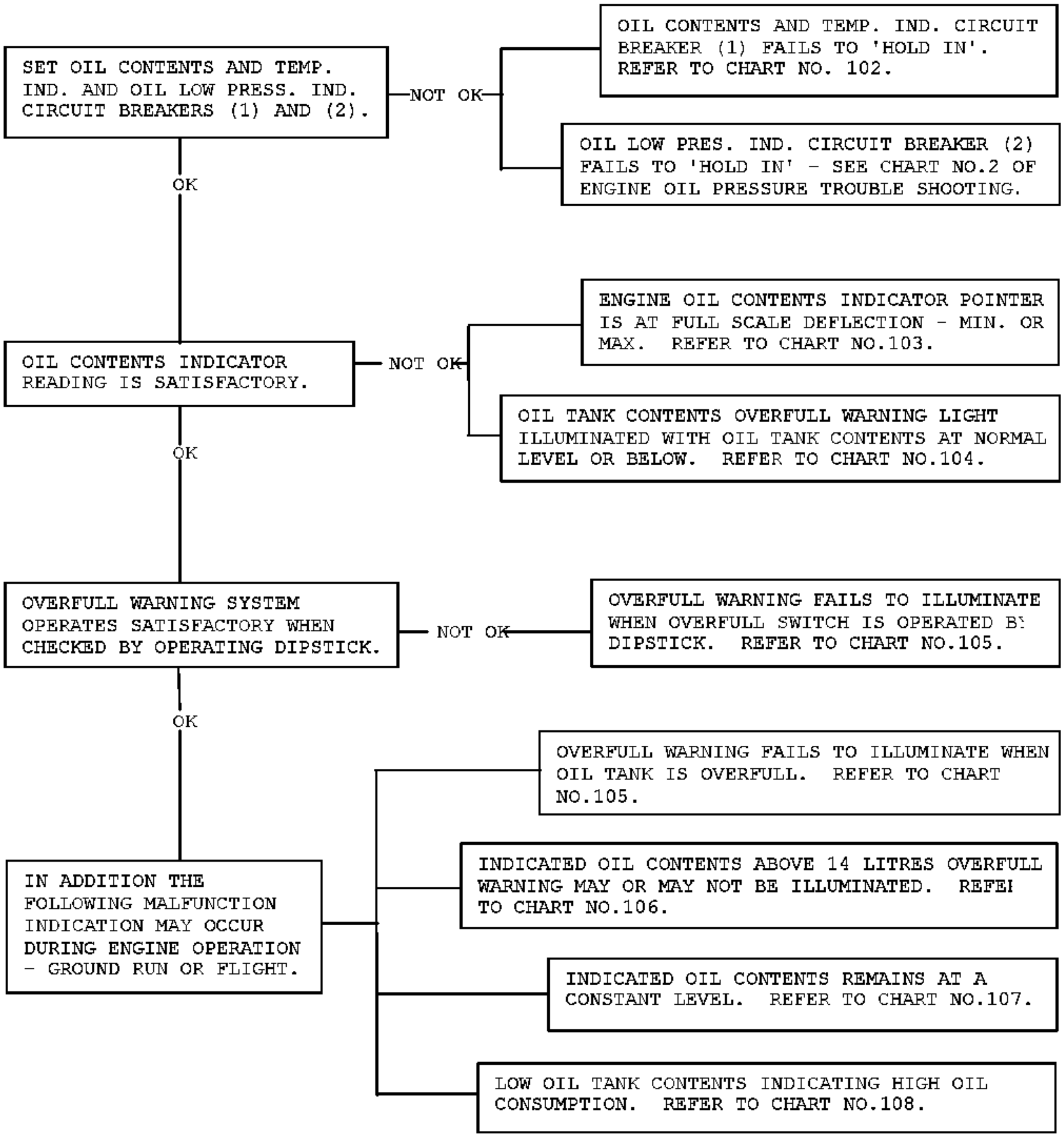

Chart 101

PRINTED IN ENGLAND

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (115V a.c.)
CIRCUIT BREAKER SAFETY CLIPS
MULTI-TEST METER

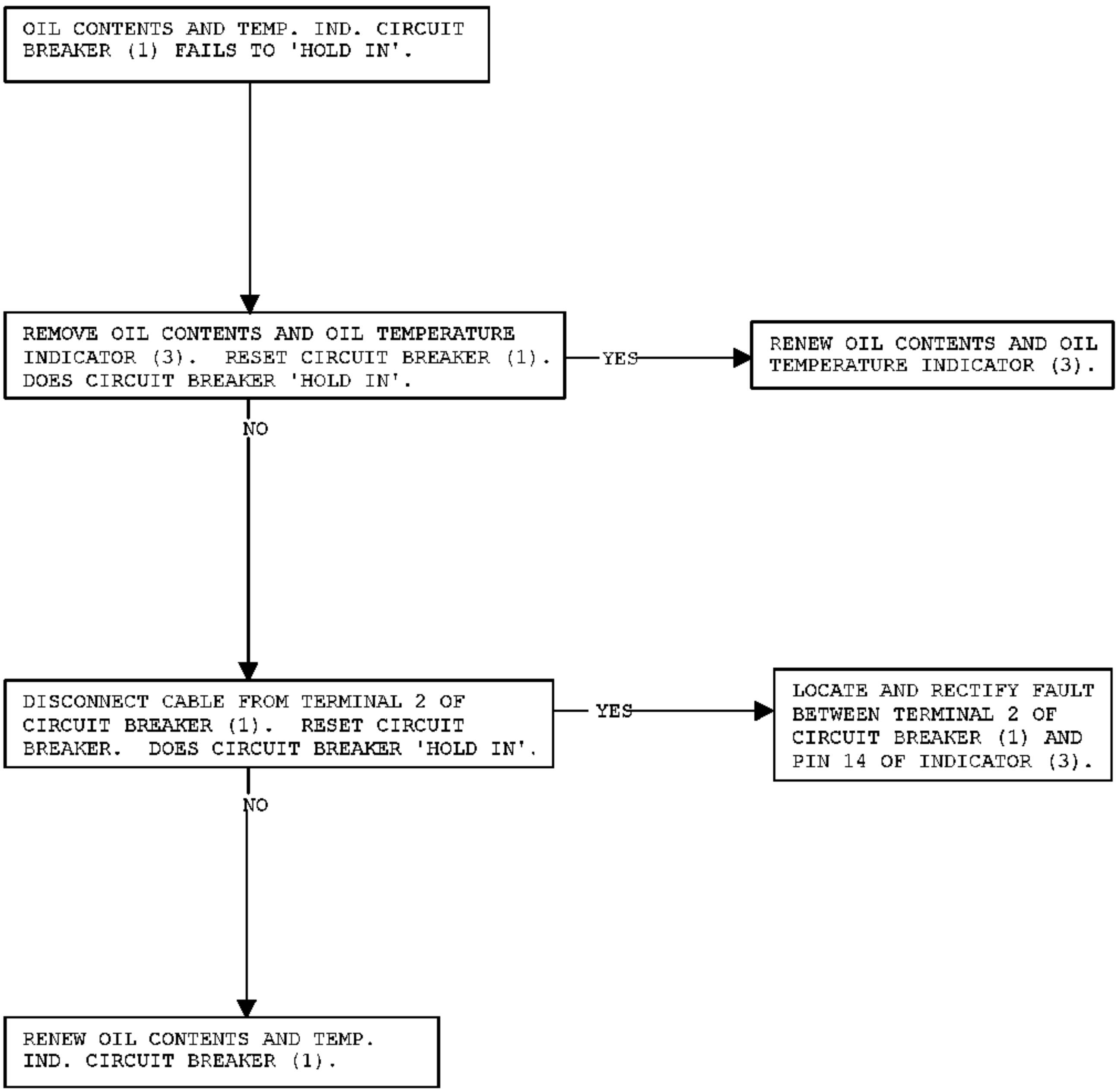

Chart 102

NOTE 1: NORMALLY THE RESISTANCE MEASURED WILL BE IN RELATIONSHIP TO QUANTITY OF OIL IN TANK. 5 LITRES WILL EQUAL APPROX 350 OHMS.

NOTE 2: AN OPEN CIRCUIT IN THE OIL CONTENTS TRANSMITTER AND OVERFULL SWITCH RESISTANCE CHAIN WILL RESULT IN A CORRECT OIL CONTENTS INDICATION UP TO THE POINT OF THE OPEN CIRCUIT RESISTOR, THEREAFTER THE INDICATOR POINTER WILL MOVE TO FULL SCALE DEFLECTION "HIGH".

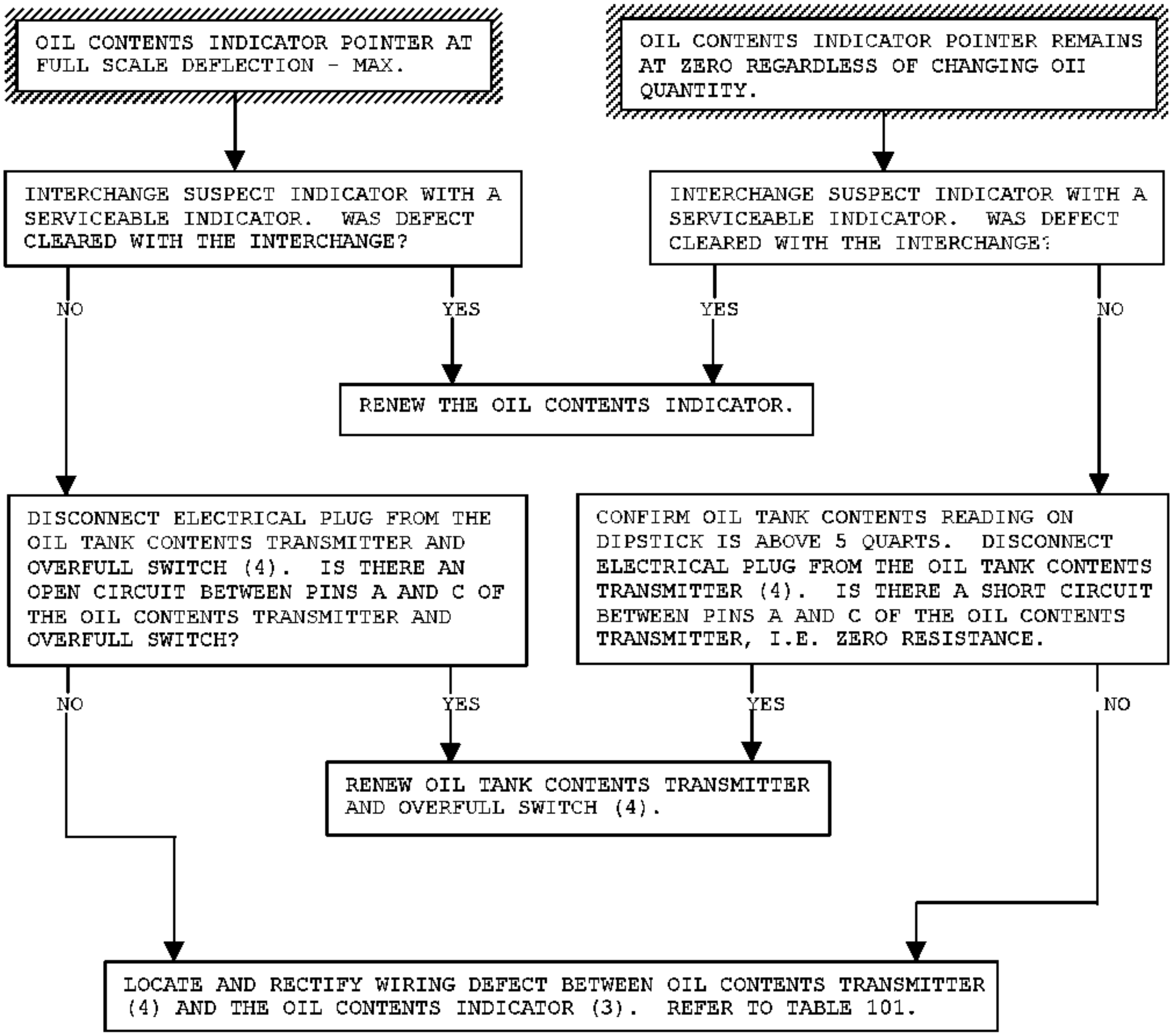

Chart 103

OIL TANK CONTENTS OVERFULL WARNING LIGHT ILLUMINATED WITH OIL TANK CONTENTS INDICATION AT NORMAL LEVEL

TRIP CIRCUIT BREAKER E61 (2). THIS WILL EXTINGUISH THE LOW OIL PRESSURE WARNING LIGHT AND THE OVERFULL WARNING LIGHT. DISCONNECT ELECTRICAL PLUG FROM THE OIL TANK CONTENTS TRANSMITTER, RESET CIRCUIT BREAKER E61. DOES OVERFULL WARNING LIGHT ILLUMINATE?

NO

RENEW OIL TANK CONTENTS TRANSMITTER.

YES

DISCONNECT ELECTRICAL CABLE FROM OIL CONTENTS INDICATOR, E233. IDENTIFY SOCKET NUMBER 1 OF THE ELECTRICAL PLUG. IS THERE 28V D.C. AVAILABLE AT SOCKET 1?

YES

RENEW WARNINGS TEST PUSH SWITCH E234 (13).

NO

REFER TO LIGHTS TEST TROUBLE SHOOTING. WIRING DIAGRAM 34-14-11.

Chart 104

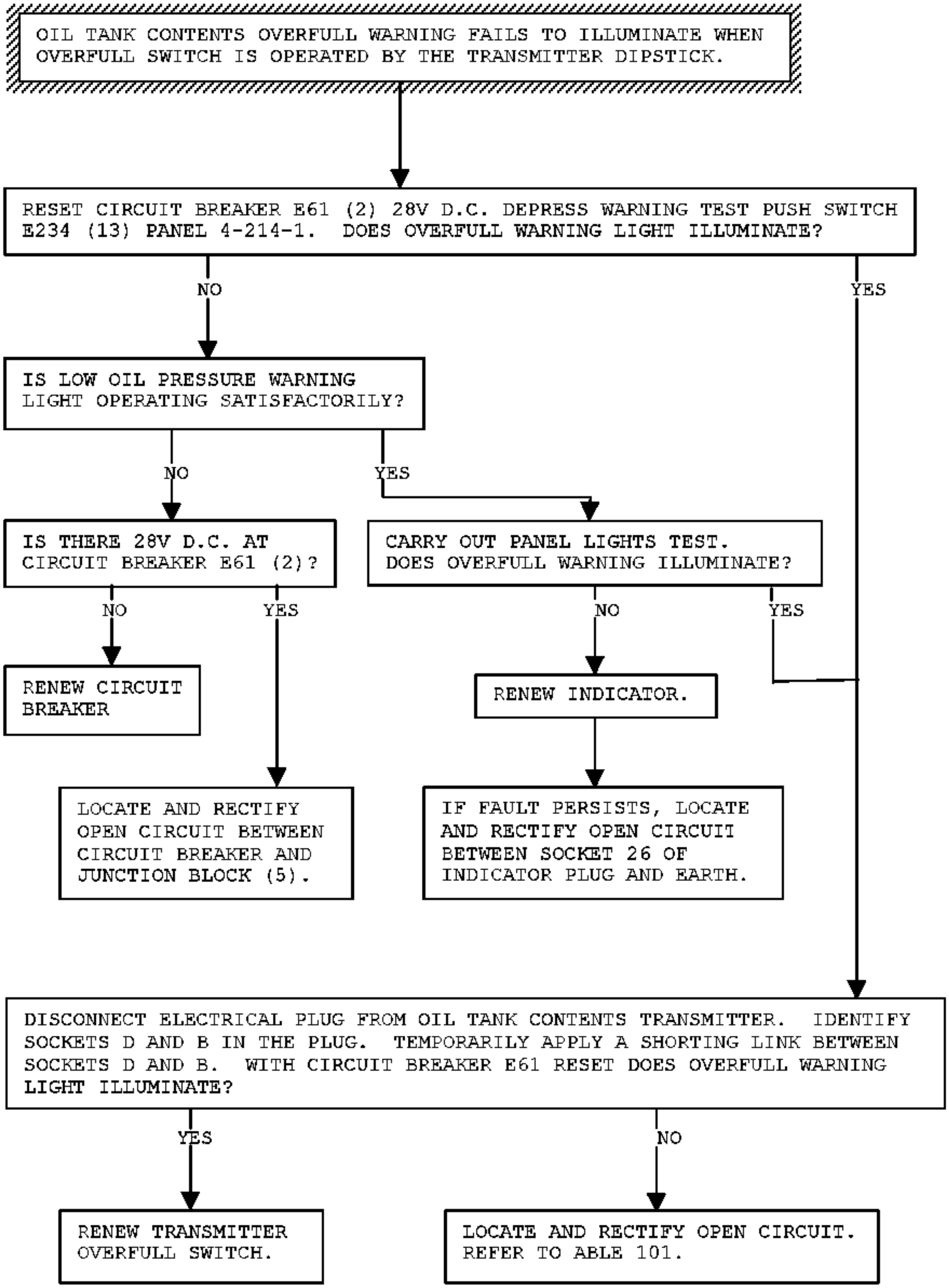
OIL TANK CONTENTS OVERFULL WARNING FAILS TO ILLUMINATE WHEN OVERFULL SWITCH IS OPERATED BY THE TRANSMITTER DIPSTICK.
RESET CIRCUIT BREAKER E61 (2) 28V D.C. DEPRESS WARNING TEST PUSH SWITCH E234 (13) PANEL 4-214-1. DOES OVERFULL WARNING LIGHT ILLUMINATE?
NO
YES
IS LOW OIL PRESSURE WARNING LIGHT OPERATING SATISFACTORILY?
NO
YES
IS THERE 28V D.C. AT CIRCUIT BREAKER E61 (2)?
CARRY OUT PANEL LIGHTS TEST. DOES OVERFULL WARNING ILLUMINATE?
NO
YES
NO
YES
RENEW CIRCUIT BREAKER
RENEW INDICATOR.
LOCATE AND RECTIFY OPEN CIRCUIT BETWEEN CIRCUIT BREAKER AND JUNCTION BLOCK (5).
IF FAULT PERSISTS, LOCATE AND RECTIFY OPEN CIRCUIT BETWEEN SOCKET 26 OF INDICATOR PLUG AND EARTH.
DISCONNECT ELECTRICAL PLUG FROM OIL TANK CONTENTS TRANSMITTER. IDENTIFY SOCKETS D AND B IN THE PLUG. TEMPORARILY APPLY A SHORTING LINK BETWEEN SOCKETS D AND B. WITH CIRCUIT BREAKER E61 RESET DOES OVERFULL WARNING LIGHT ILLUMINATE?
YES
NO
RENEW TRANSMITTER OVERFULL SWITCH.
LOCATE AND RECTIFY OPEN CIRCUIT. REFER TO ABLE 101.

Chart 105

NOTE 1: A CONDITION CAN EXIST WHERE THE OIL CONTENTS IS ABOVE 14 LITRES BUT BELOW THE LEVEL NECESSARY TO OPERATE THE OVERFULL WARNING SWITCH.

NOTE 2: WHEN THE ENGINE OIL SYSTEM HAS BEEN CONTAMINATED ALL OIL MUST BE DRAINED FROM THE ENGINE AND THE SYSTEM FLUSHED OUT AS SPECIFIED IN 79-00-04.

GROUND EQUIPMENT DESCRIPTION

GROUND POWER SUPPLY 115V A.C. AND 28V D.C.
CIRCUIT BREAKER SAFETY CLIPS
SAMPLING BOTTLE PE.15920
GAS DETECTOR ASSEMBLY PE.15903
GAS DETECTOR TUBE PE.15904
DECADE RESISTANCE BOX
CONTAINER FOR OIL DRAINAGE
DRAIN TUBE PE.26472

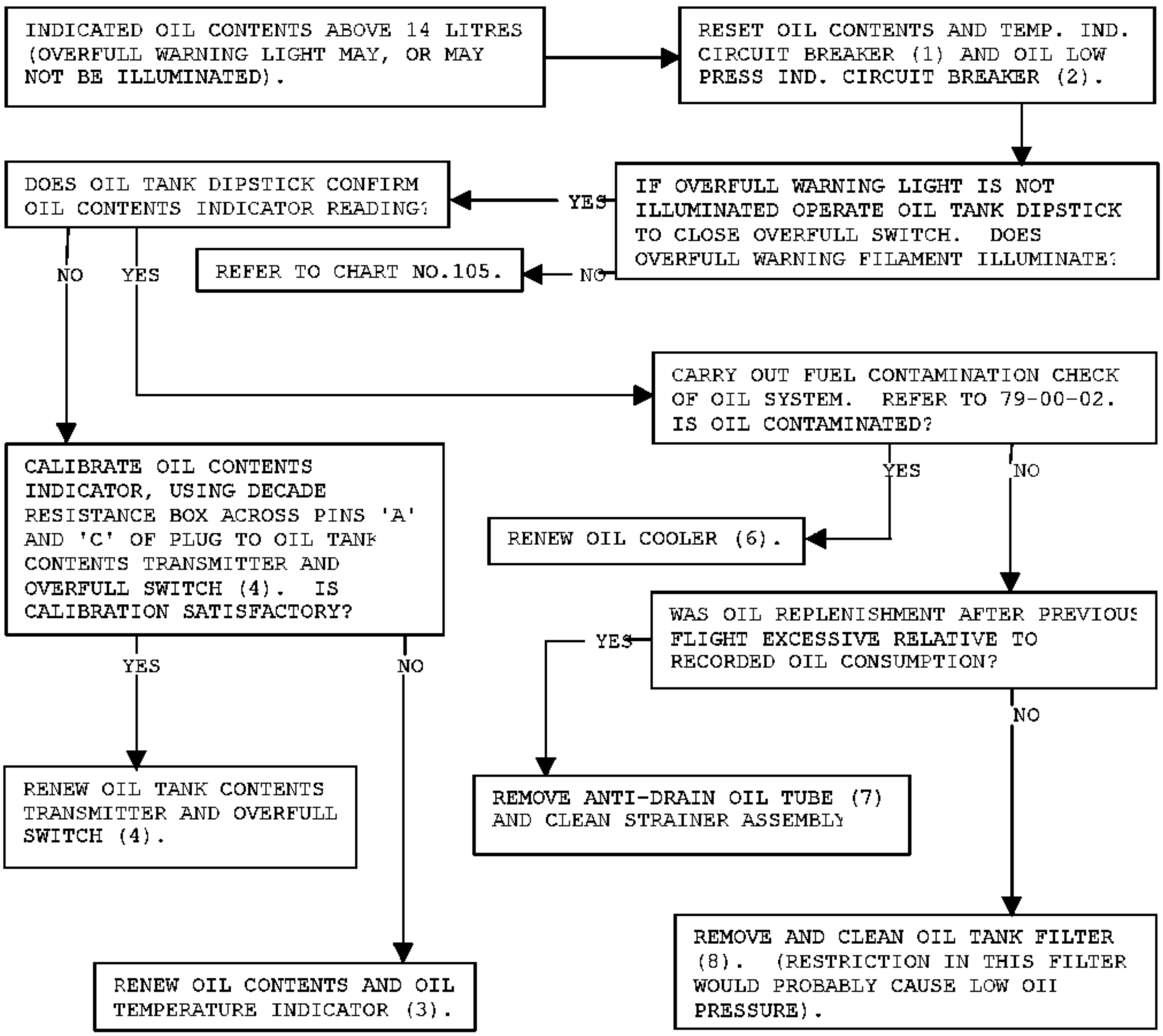

Chart 106

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NOTE 1: A CONTENTS TRANSMITTER REED SWITCH FAILING IN THE CLOSED POSITION WILL RESULT IN A CORRECT OIL CONTENTS INDICATION UP TO THE FAILED SWITCH POSITION. THEREAFTER THE INDICATED OIL CONTENTS WILL REMAIN CONSTANT AT A VALUE EQUIVALENT TO THE POSITION OF THE FAILED SWITCH.

NOTE 2: WHEN THE OIL SYSTEM HAS BEEN CONTAMINATED, ALL OIL MUST BE DRAINED FROM THE ENGINE AND THE SYSTEM FLUSHED OUT AS SPECIFIED IN 79-00-04.

INDICATED OIL CONTENTS REMAINS AT A CONSTANT LEVEL.

RESET OIL CONTENTS AND TEMP. IND. CIRCUIT BREAKER (1) AND OIL LOW PRESS. IND. CIRCUIT BREAKER (2).

DOES OIL TANK DIPSTICK READING AGREE WITH THAT OF OIL TANK CONTENTS INDICATOR?

YES

NO

TRIP OIL CONTENTS AND TEMP. IND. AND OIL LOW PRESS. IND. CIRCUIT BREAKERS (1) AND (2). DISCONNECT POWER SUPPLY PLUG FROM OIL TANK CONTENTS TRANSMITTER AND OVERFULL SWITCH (4). IS RESISTANCE VALUE MEASURED ACROSS PIN 'A' AND 'C' OF TRANSMITTER EQUIVALENT TO CONTENTS INDICATED ON OIL TANK DIPSTICK?

NO

YES

RENEW OIL CONTENTS AND OIL TEMPERATURE INDICATOR (3).

RENEW OIL TANK CONTENTS TRANSMITTER AND OVERFULL SWITCH (4).

Chart 107 (Sheet 1 of 2)

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY '115V A.C.
AND 28V D.C.)
CIRCUIT BREAKER SAFETY CLIPS
SAMPLING BOTTLE PE.15920
GAS DETECTOR ASSEMBLY PE.15903
GAS DETECTOR TUBE PE.15904
MULTI-TEST METER
CONTAINER FOR OIL DRAINAGE
DRAIN TUBE PE.26472

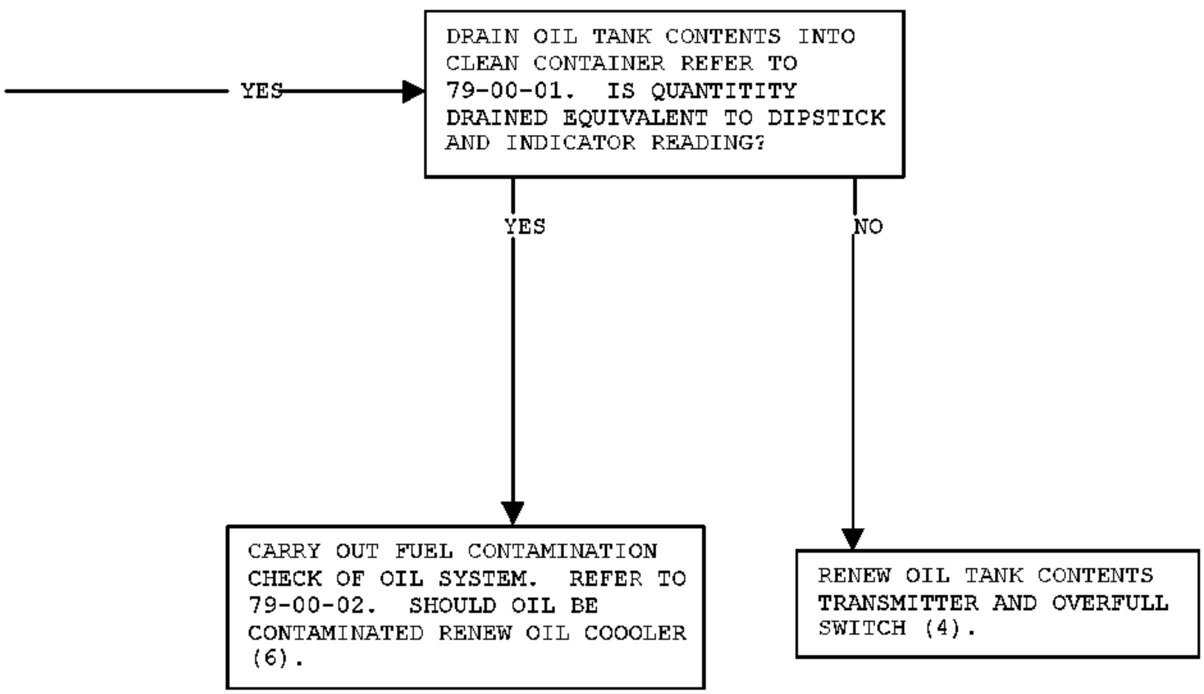
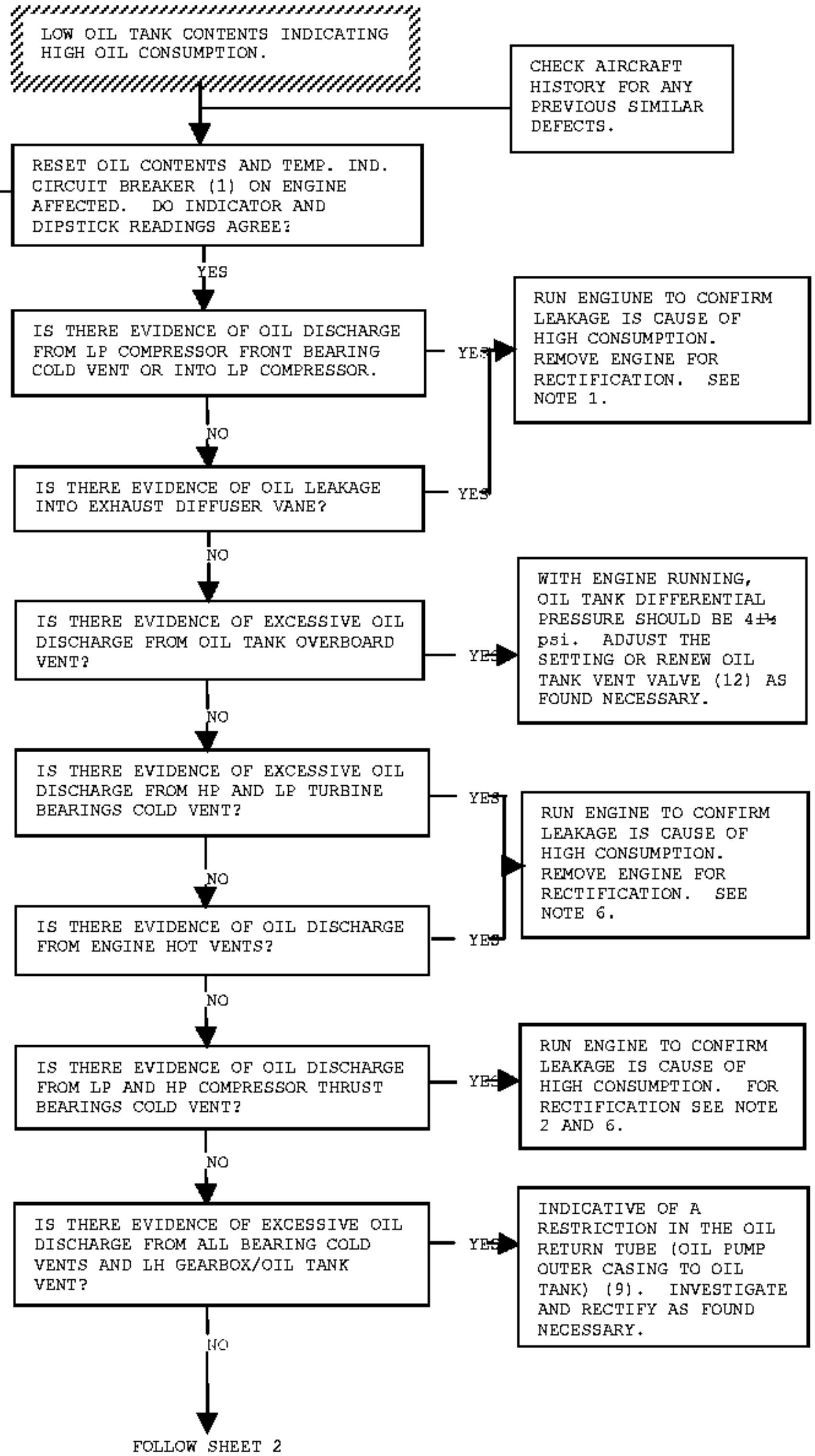


Chart 107 (Sheet 2 of 2)

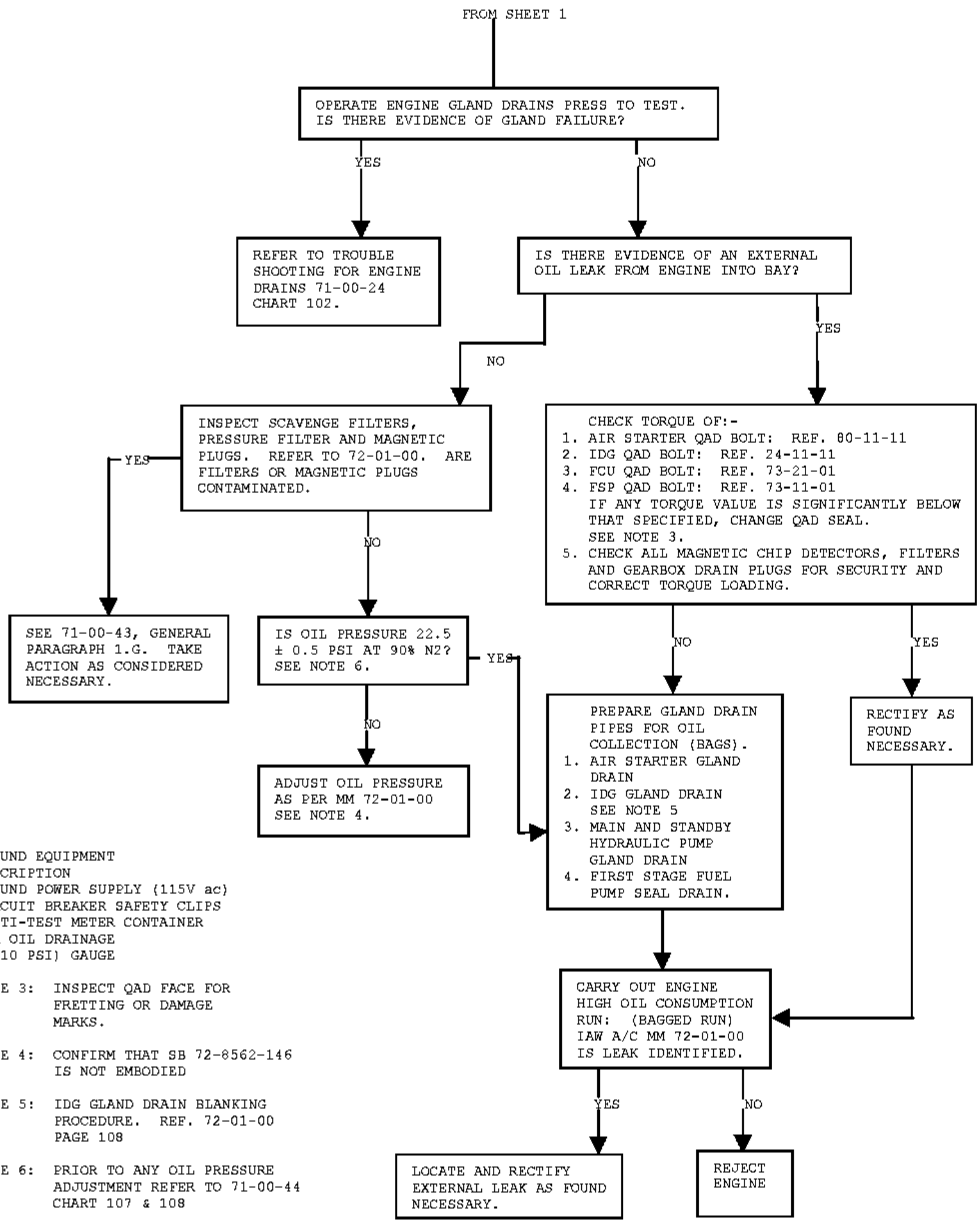
NOTE: FOR IDENTIFICATION OF ENGINE HOT AND COLD VENTS REFER TO 75-00-00.



NOTE 1: REAR BEARING HOUSING LEAK. REFER TO SB 72-7930-50.

NOTE 2: EMBODY NO.2 AND 3 BEARING COLD VENT MODIFICATION SB 72-8562-146.

Chart 108 (Sheet 1 of 2)



GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (115V ac)
CIRCUIT BREAKER SAFETY CLIPS
MULTI-TEST METER CONTAINER
FOR OIL DRAINAGE
(0-10 PSI) GAUGE

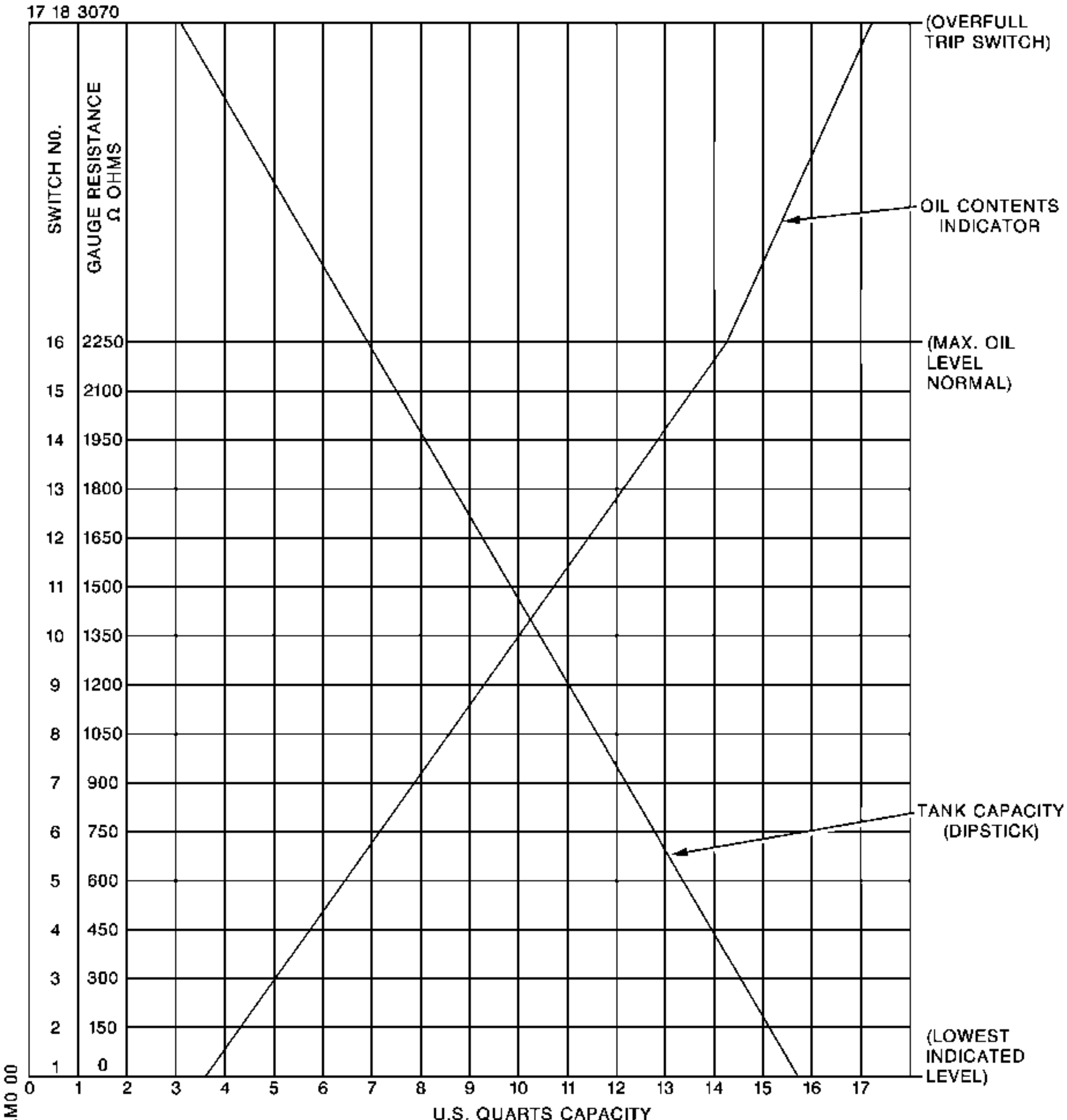
NOTE 3: INSPECT QAD FACE FOR FRETTING OR DAMAGE MARKS.

NOTE 4: CONFIRM THAT SB 72-8562-146 IS NOT EMBODIED

NOTE 5: IDG GLAND DRAIN BLANKING PROCEDURE. REF. 72-01-00 PAGE 108

NOTE 6: PRIOR TO ANY OIL PRESSURE ADJUSTMENT REFER TO 71-00-44 CHART 107 & 108

Chart 108 (Sheet 2 of 2)



U.S. QUARTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
LITRES	.95	1.90	2.84	3.79	4.73	5.68	6.63	7.58	8.53	9.48	10.42	11.36	12.31	13.27	14.20	15.16	16.10

LITRES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
U.S. QUARTS	1.06	2.12	3.17	4.26	5.29	6.34	7.40	8.45	9.51	10.57	11.63	12.70	13.75	14.80	15.85	16.90	17.95

CONVERSION TABLE

Relationship Between Dipstick and Indicator
Figure 101

ITEM NO. AND DESCRITION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
ENGINE 1						
(1) Circuit breaker 115 V	-	14-215	1E232	Map Ref. D14		79-30-51
(2) Circuit breaker 28 V	-	5-213	1E61	Map Ref. A1		79-30-51
(3) Oil contents and oil temperature indicator	-	4-214	1E233	-	79-30-00	79-30-51
(4) Oil tank contents transmitter and overfull switch	-	415	E231	-	79-31-01	79-30-51
(5) Junction block	-	533	UG5029 (2)	-	79-30-00	79-30-51
(6) Oil cooler	-	415	-	-	79-21-01	-
(7) Tube, anti-drain connection on tube, oil cooler to oil tank	-	415	-	-	79-22-03	-
(8) Oil tank filter	-	415	-	-	79-11-01	-
(9) Oil return tube (oil pump outer casing to oil tank)	-	415	-	-	79-22-02	-
(10) Reheat injection system	-	415/ 416	-	-	73-12-06	-
(11) Jet pipe thermocouple harness	-	415/ 416	-	-	77-21-02	-

Component Identification
Table 101 (Continued)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(12) Oil tank vent valve	-	415	-	-	79-11-01	-
(13) Warning test push switch	-	4-214 -1	1E234	-	-	79-30-51
ENGINE NO.2						
(1) Circuit breaker 115 V	-	13-215	2E232	Map Ref. G13		79-30-51
(2) Circuit breaker 28 V	-	1-213	2E61	Map Ref. C5		79-30-12
(3) Oil contents and oil temperature indicator	-	4-214	2E233	-	79-30-00	79-30-51
(4) Oil tank contents transmitter and overfull switch	-	425	2E231	-	79-31-01	79-30-51
(5) Junction block	-	534	UG5023 (2)	-	79-30-00	79-30-51
(6) Oil cooler	-	425	-	-	79-21-01	-
(7) Tube, anti-drain connection on tube, oil cooler to oil tank	-	425	-	-	79-22-03	-
(8) Oil tank filter	-	425	-	-	79-11-01	-
(9) Oil return tube (oil pump outer casing to oil tank)	-	425	-	-	79-22-02	-

Component Identification
Table 101 (Continued)

ITEM NO. AND DESCRITION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(10) Reheat injection system	-	425/ 426	-	-	73-12-06	-
(11) Jet pipe thermocouple harness	-	425/ 426	-	-	77-21-02	-
(12) Oil tank vent valve	-	425	-	-	79-11-01	-
(13) Warning test push switch	-	4-214 -1	2E234	-	-	79-30-51
ENGINE NO.3						
(1) Circuit breaker 115 V	-	13-216	3E232	Map Ref. D7	-	79-30-52
(2) Circuit breaker 28 V	-	1-213	3E61	Map Ref. C6	-	79-30-13
(3) Oil contents and oil temperature indicator	-	4-214	3E233	-	79-30-00	79-30-52
(4) Oil tank contents transmitter and overfull switch	-	435	3E231	-	79-31-01	79-30-52
(5) Junction block	-	634	UG6023 (2)	-	79-30-00	79-30-52
(6) Oil cooler	-	435	-	-	79-21-01	-
(7) Tube, anti-drain connection on tube, oil cooler to oil tank	-	435	-	-	79-22-03	-

Component Identification
Table 101 (Continued)

ITEM NO. AND DESCRITION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(8) Oil tank filter	-	435	-	-	79-11-01	-
(9) Oil return tube (oil pump outer casing to oil tank)	-	435	-	-	79-22-02	-
(10) Reheat injection system	-	435/ 436	-	-	73-12-06	-
(11) Jet pipe thermocouple harness	-	435/ 436	-	-	77-21-02	-
(12) Oil tank vent valve	-	435	-	-	79-11-01	-
(13) Warning test push switch	-	4-214 -1	3E234	-	-	79-30-52
ENGINE NO.4						
(1) Circuit breaker 115 V	-	14-216	4E232	Map Ref. E6	-	79-30-52
(2) Circuit breaker 28 V	-	5-213	4E61	Map Ref. A2	-	79-30-14
(3) Oil contents and oil temperature indicator	-	4-214	4E233	-	79-30-00	79-30-52
(4) Oil tank contents transmitter and overfull switch	-	445	4E231	-	79-31-01	79-30-52
(5) Junction block	-	633	UG6029 (2)	-	79-30-00	79-30-52

Component Identification
Table 101 (Continued)

ITEM NO. AND DESCRITION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(6) Oil cooler	-	445	-	-	79-21-01	-
(7) Tube, anti-drain connection on tube, oil cooler to oil tank	-	445	-	-	79-22-03	-
(8) Oil tank filter	-	445	-	-	79-11-01	-
(9) Oil return tube (oil pump outer casing to oil tank)	-	445	-	-	79-22-02	-
(10) Reheat injection system	-	445/ 446	-	-	73-12-06	-
(11) Jet pipe thermocouple harness	-	445/ 446	-	-	77-21-02	-
(12) Oil tank vent valve	-	445	-	-	79-11-01	-
(13) Warning test push switch	-	4-214	4E234	-	-	79-30-52

Component Identification
Table 101 (Concluded)

OIL PRESSURE - TROUBLE SHOOTING

1. General

A. The engine oil pressure system is of the constant differential pressure type, the differential pressure varying over the operating range only by the small factor of the pressure relief valve spring rate tolerance.

B. Indication of system pressure is provided by an indicator receiving a signal from a pressure transmitter. A low pressure warning light in the indicator is activated by a pressure switch in a different electric circuit to that of the transmitter. Should these indications be at variance with each other, it is probably due to a defect in the warning light or indication circuit and not a basic oil system fault.

C. Negative 'G' in excess of approximately two seconds duration will result in a temporary acceptable loss of oil pressure. The oil pump should automatically reprime when normal 'G' conditions are attained.

D. Where a defect is proved to be in the basic oil or lubrication systems, the spectrometric oil analysis and magnetic plug records should whenever possible, be examined as they could provide assistance in locating or confirming a defect.

E. When inspection of the oil pressure relief valve is carried out, the exact setting of the adjuster should be noted prior to dismantling. On assembly, the adjuster should be screwed in to its original setting.

F. Contamination of filters and magnetic plugs will fall into one of three categories i.e. normal, contamination above normal but considered satisfactory for further flight with additional monitoring as considered necessary, and sufficient contamination to warrant rectification
R action before further flight. In addition to metallic
R contamination, carbon is also a possible cause of filter
R contamination.

When contamination in the last category is encountered, and it is considered safe and unlikely to cause further engine damage, in view of the modular construction of the engine, the following should be considered: installing clean filters and magnetic plugs, also additional magnetic plugs, then carry out an engine run to establish the section of engine in which the debris

is being generated. Information from this check may lead to a simple module change instead of a complete engine strip.

When an engine oil system is contaminated, consideration must be given to the flushing procedure given in 79-00-04. In the event of metallic contamination, consideration must also be given to removing the fuel cooled oil cooler for cleaning in accordance with vendor's Overhaul Manual procedure. Carbon is known to build up in service around the No.4 bearing housing but due to frequent engine operation the carbon remains soft and intact. When an engine is removed and is allowed to stand for a period of time the carbon hardens and becomes brittle. Subsequent engine running causes the carbon to crack and to be released into the oil scavenge system.

If any filters are found to be blocked with carbon they must be cleaned and replaced.

An engine run must then be carried out and the filters rechecked. If they still show contamination the clean/replace/engine run/ re-check cycle must be repeated until such time that no carbon is found.

<u>Action</u>

When troubleshooting problems such as

a) high oil consumption

b) low oil pressure

c) fluctuating oil pressure

the following, amended, troubleshooting charts are to be used:- 71-00-44 Chart 107 - Oil pressure below normal, LOP light out 71-00-44 Chart 108 - Oil pressure fluctuating 71-00-44 Chart 110 - Low oil pressure, LOP light ON

<u>NOTE:</u> Where problem is solely one of HOC i.e. not just a pressure problem troubleshooting in 72-01-00 Page Block 101 is recommended

G. Any investigation into increased or high engine oil consumption should include Engine Anti-icing - Trouble Shooting (71-00-22) and Engine Drains - Trouble Shooting (71-00-24).

H. Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is detailed in Table 101.

2. Preparation

WARNING: COMPLY WITH ELECTRICAL SAFETY PRECAUTIONS DETAILED

A. Ensure that external electrical power supply is connected and switched on.

B. Consult chart 101 and carry out actions indicated to determine which of the trouble shooting charts is applicable.

3. Restore to Flight Standard

A. Complete and check any necessary rectification.

B. Reconnect all points where disconnection has been made during checking and rectification procedures.

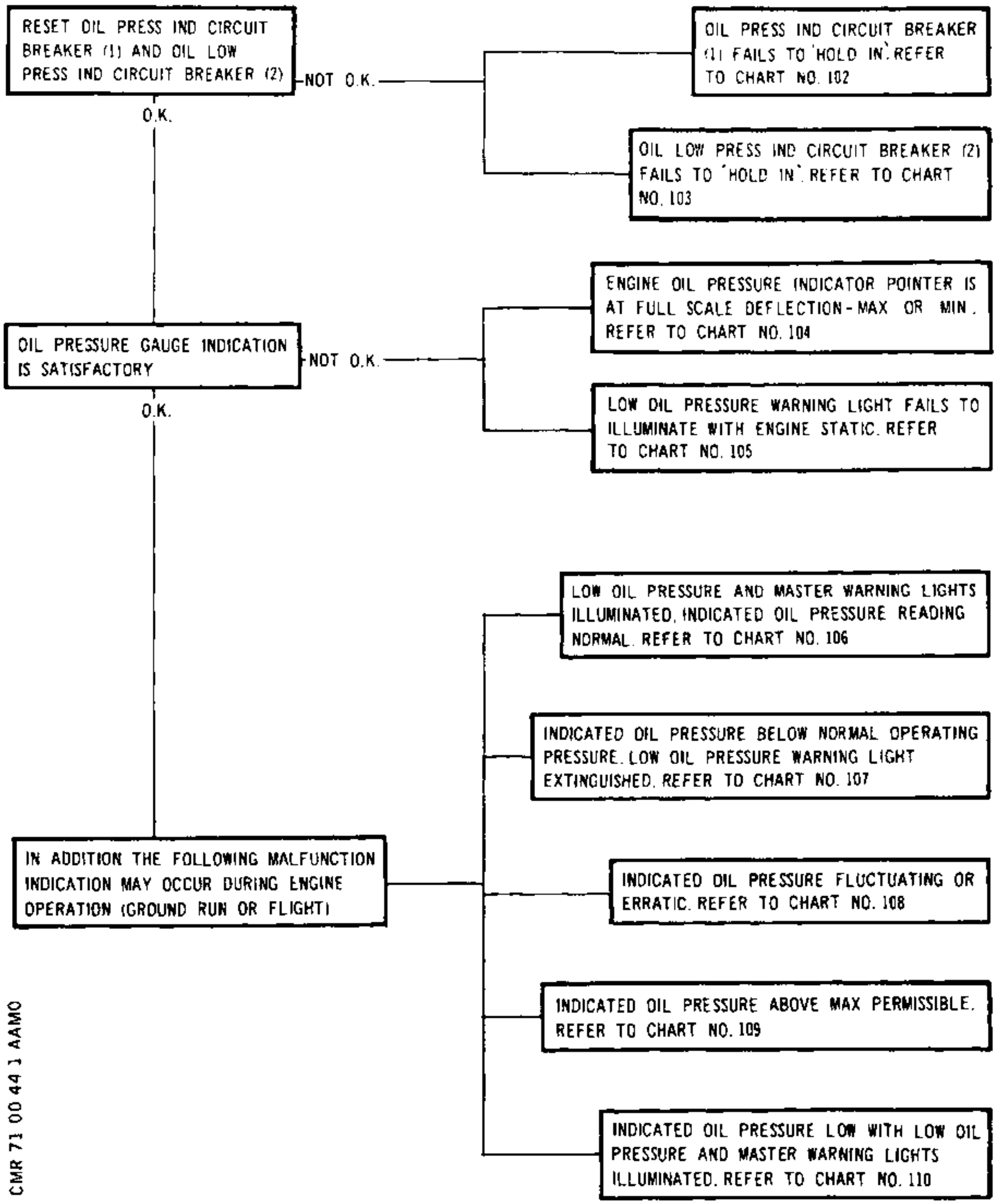

RESET OIL PRESS IND CIRCUIT BREAKER (1) AND OIL LOW PRESS IND CIRCUIT BREAKER (2)
NOT O.K.
OIL PRESS IND CIRCUIT BREAKER (1) FAILS TO 'HOLD IN'. REFER TO CHART NO. 102
OIL LOW PRESS IND CIRCUIT BREAKER (2) FAILS TO 'HOLD IN'. REFER TO CHART NO. 103
O.K.
OIL PRESSURE GAUGE INDICATION IS SATISFACTORY
NOT O.K.
ENGINE OIL PRESSURE INDICATOR POINTER IS AT FULL SCALE DEFLECTION - MAX OR MIN. REFER TO CHART NO. 104
LOW OIL PRESSURE WARNING LIGHT FAILS TO ILLUMINATE WITH ENGINE STATIC. REFER TO CHART NO. 105
O.K.
IN ADDITION THE FOLLOWING MALFUNCTION INDICATION MAY OCCUR DURING ENGINE OPERATION (GROUND RUN OR FLIGHT)
LOW OIL PRESSURE AND MASTER WARNING LIGHTS ILLUMINATED, INDICATED OIL PRESSURE READING NORMAL. REFER TO CHART NO. 106
INDICATED OIL PRESSURE BELOW NORMAL OPERATING PRESSURE. LOW OIL PRESSURE WARNING LIGHT EXTINGUISHED. REFER TO CHART NO. 107
INDICATED OIL PRESSURE FLUCTUATING OR ERRATIC. REFER TO CHART NO. 108
INDICATED OIL PRESSURE ABOVE MAX PERMISSIBLE. REFER TO CHART NO. 109
INDICATED OIL PRESSURE LOW WITH LOW OIL PRESSURE AND MASTER WARNING LIGHTS ILLUMINATED. REFER TO CHART NO. 110
CMR 71 00 44 1 AAMO

Chart 101

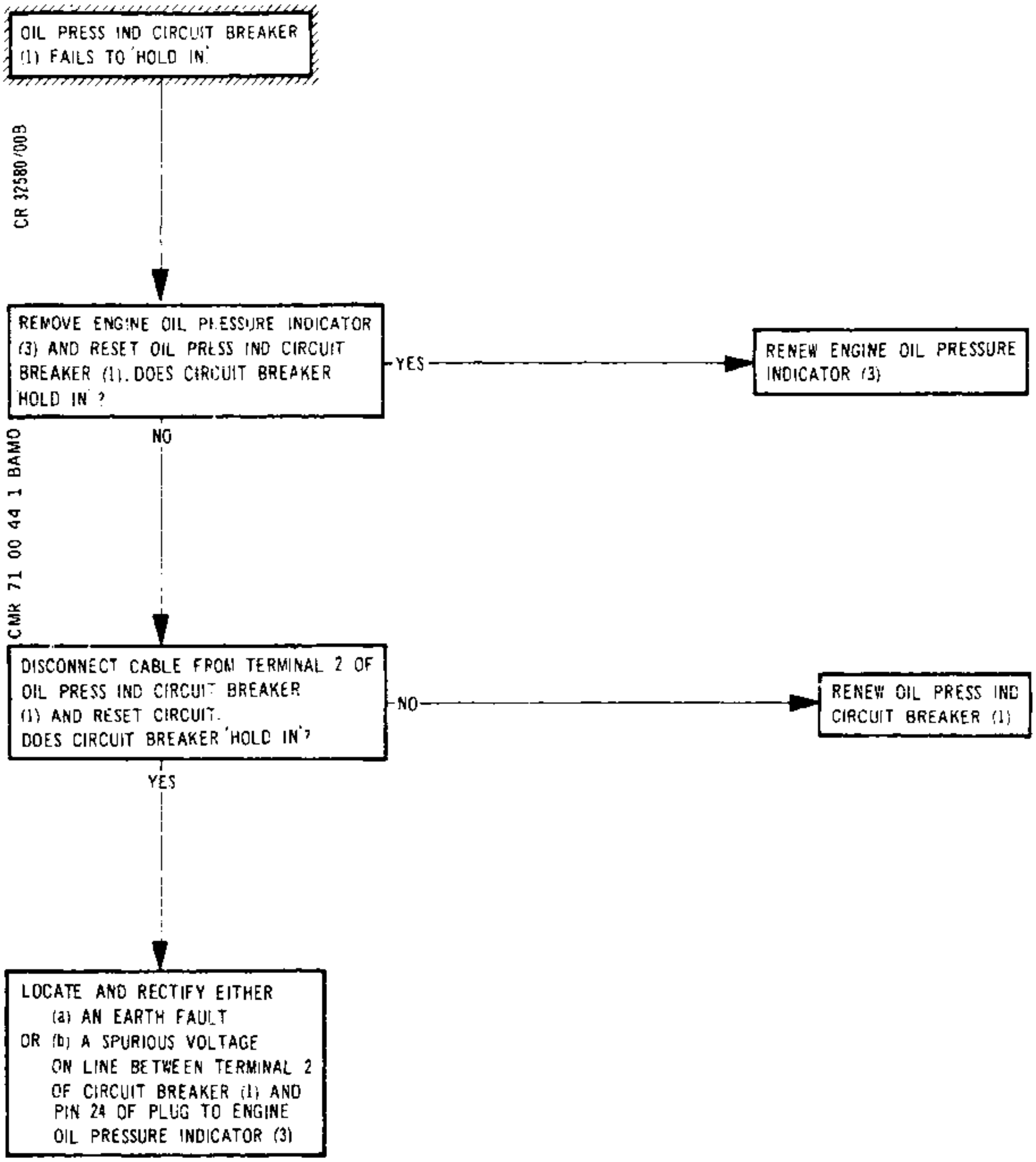

OIL PRESS IND CIRCUIT BREAKER (1) FAILS TO 'HOLD IN'
CR 32580/003
REMOVE ENGINE OIL PRESSURE INDICATOR (3) AND RESET OIL PRESS IND CIRCUIT BREAKER (1). DOES CIRCUIT BREAKER 'HOLD IN'?
YES
RENEW ENGINE OIL PRESSURE INDICATOR (3)
NO
CMR 71 00 44 1 BAMO
DISCONNECT CABLE FROM TERMINAL 2 OF OIL PRESS IND CIRCUIT BREAKER (1) AND RESET CIRCUIT. DOES CIRCUIT BREAKER 'HOLD IN'?
NO
RENEW OIL PRESS IND CIRCUIT BREAKER (1)
YES
LOCATE AND RECTIFY EITHER
(a) AN EARTH FAULT
OR (b) A SPURIOUS VOLTAGE ON LINE BETWEEN TERMINAL 2 OF CIRCUIT BREAKER (1) AND PIN 24 OF PLUG TO ENGINE OIL PRESSURE INDICATOR (3)

Chart 102

NOTE. IF ENGINE OIL LOW PRESS IND CIRCUIT BREAKER (2) FAILS TO 'HOLD IN' ONLY WHEN OIL TANK CONTENTS TRANSMITTER AND OVERFULL SWITCH (6) IS CLOSED I.E. OIL TANK OVERFULL, IT IS INDICATIVE OF:

1. TRANSMITTER DEFECT - CHECK FOR EARTH FAULT AT PIN 'B' OF OIL TANK CONTENTS TRANSMITTER AND OVERFULL SWITCH (6)

OR 2. OIL CONTENTS INDICATOR DEFECT - REMOVE OIL CONTENTS AND OIL TEMPERATURE INDICATOR (8) AND CHECK FOR EARTH FAULT AT PIN 27

OR 3. EARTH FAULT ON CABLE BETWEEN PIN 27 OF OIL CONTENTS INDICATOR AND PIN 'B' OF OIL TANK CONTENTS TRANSMITTER AND OVERFULL SWITCH (6)

CR 32578-00B

CMR 71 00 44 1 CAMA

OIL LOW PRESS IND CIRCUIT BREAKER (2) FAILS TO 'HOLD IN' (PROVIDES SUPPLY FOR LOW OIL PRESSURE AND OVERFULL WARNINGS)

DISCONNECT CABLES FROM TERMINAL 2 OF OIL LOW PRESS IND CIRCUIT BREAKER (2). RESET CIRCUIT BREAKER. DOES CIRCUIT BREAKER 'HOLD IN' ?

YES

NO

RENEW OIL LOW PRESS IND CIRCUIT BREAKER (2)

RECONNECT PLUG TO ENGINE OIL PRESSURE SWITCH (7). REMOVE ENGINE OIL PRESSURE INDICATOR (3). IS THERE AN EARTH FAULT AT PIN NO. 7 OF PLUG TO ENGINE OIL PRESSURE INDICATOR ?

NO

YES

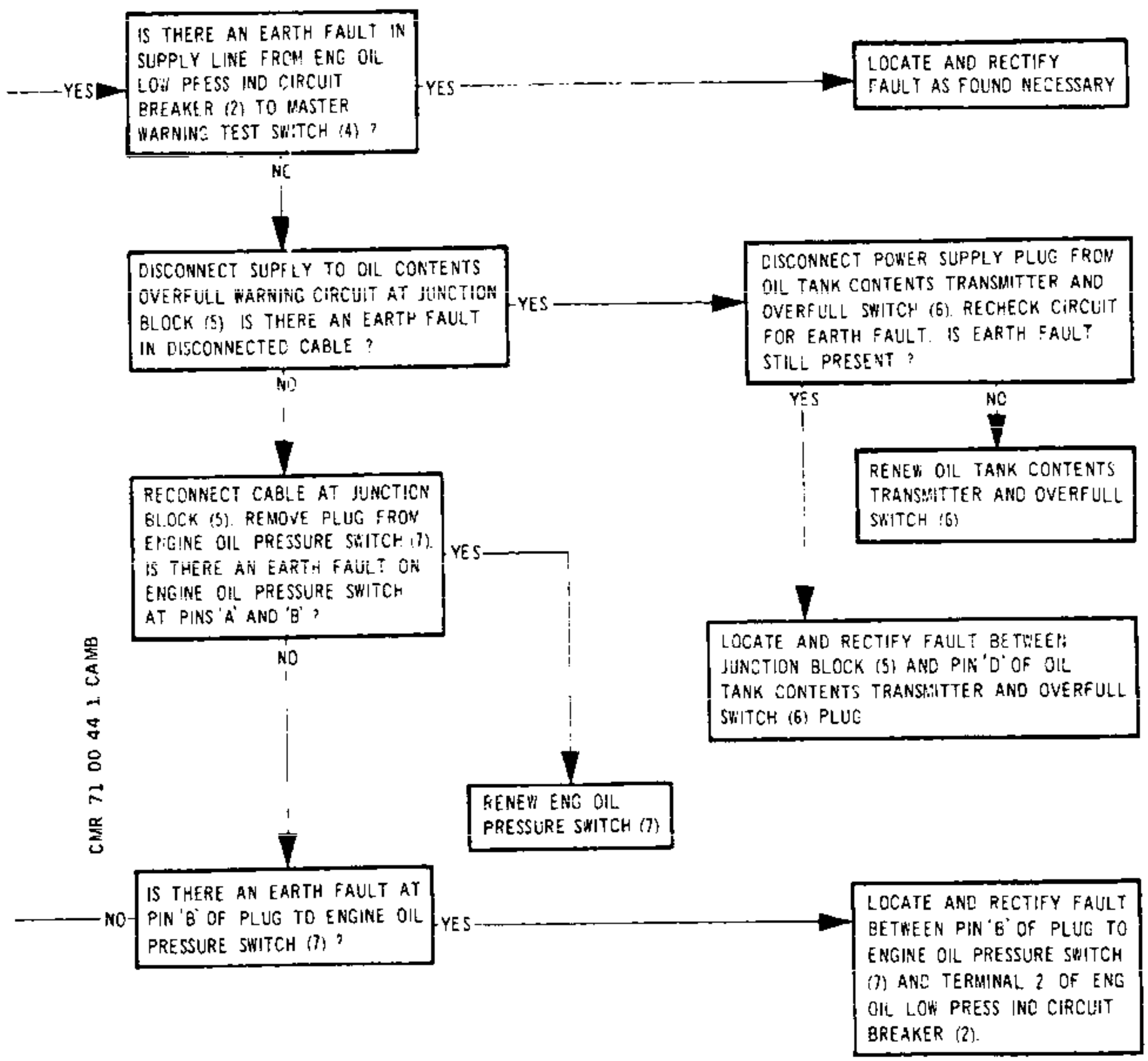
LOCATE AND RECTIFY FAULT BETWEEN PIN 7 OF ENGINE OIL PRESSURE INDICATOR (3) AND PIN 'A' OF ENGINE OIL PRESSURE SWITCH (7) PLUG.

NO

RENEW ENGINE OIL PRESSURE INDICATOR (3)

Chart 103 (Sheet 1 of 2)

CR 32579 00B



CMR 71 00 44 1 CAMB

Chart 103 (Sheet 2 of 2)

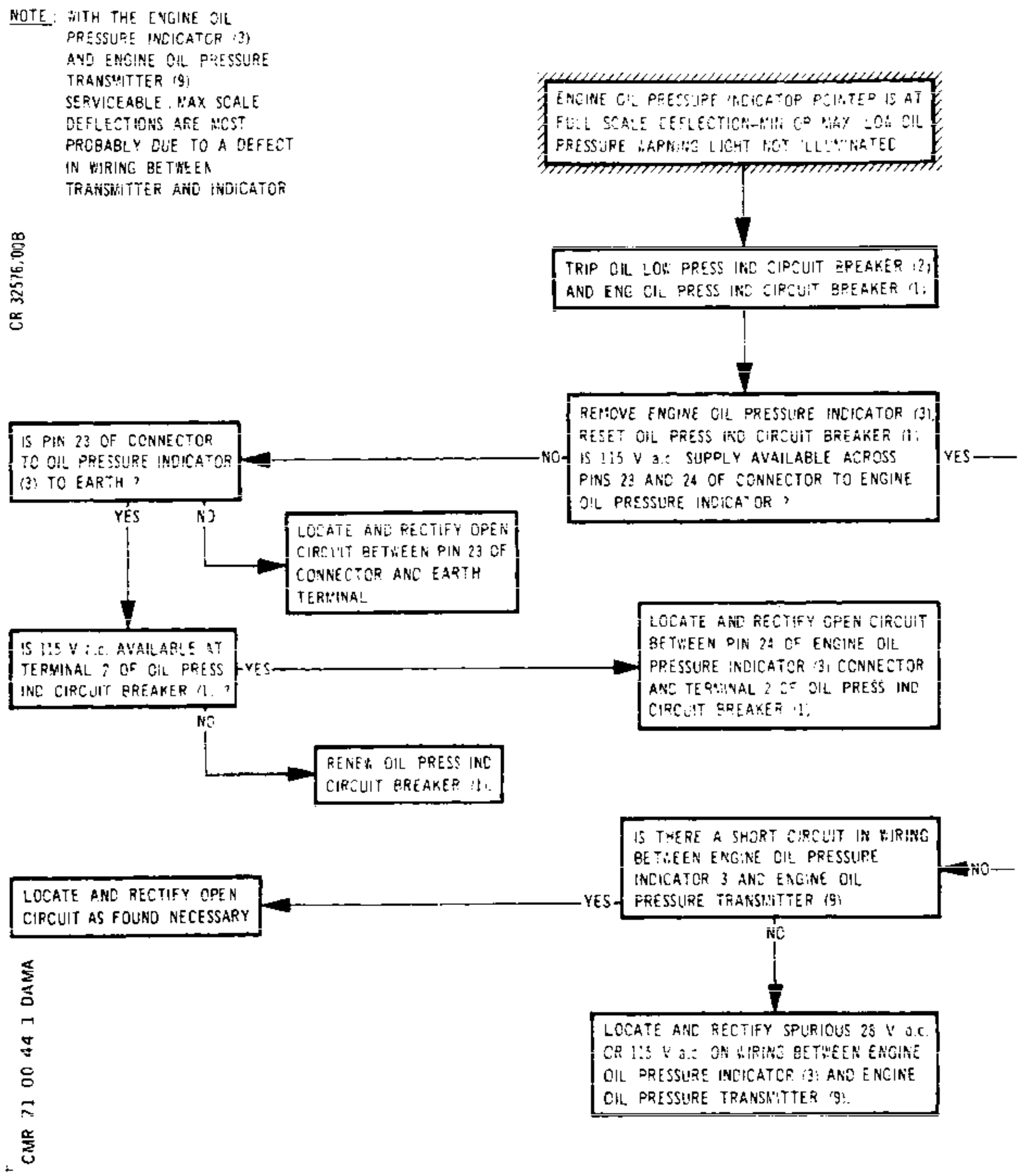
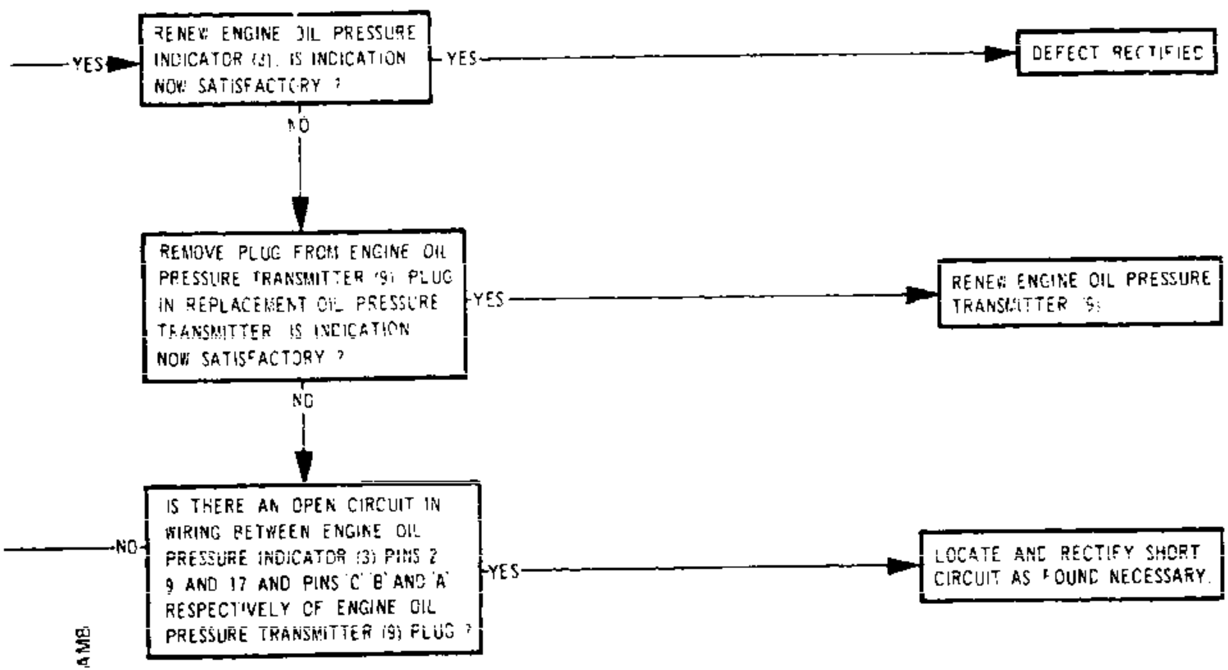


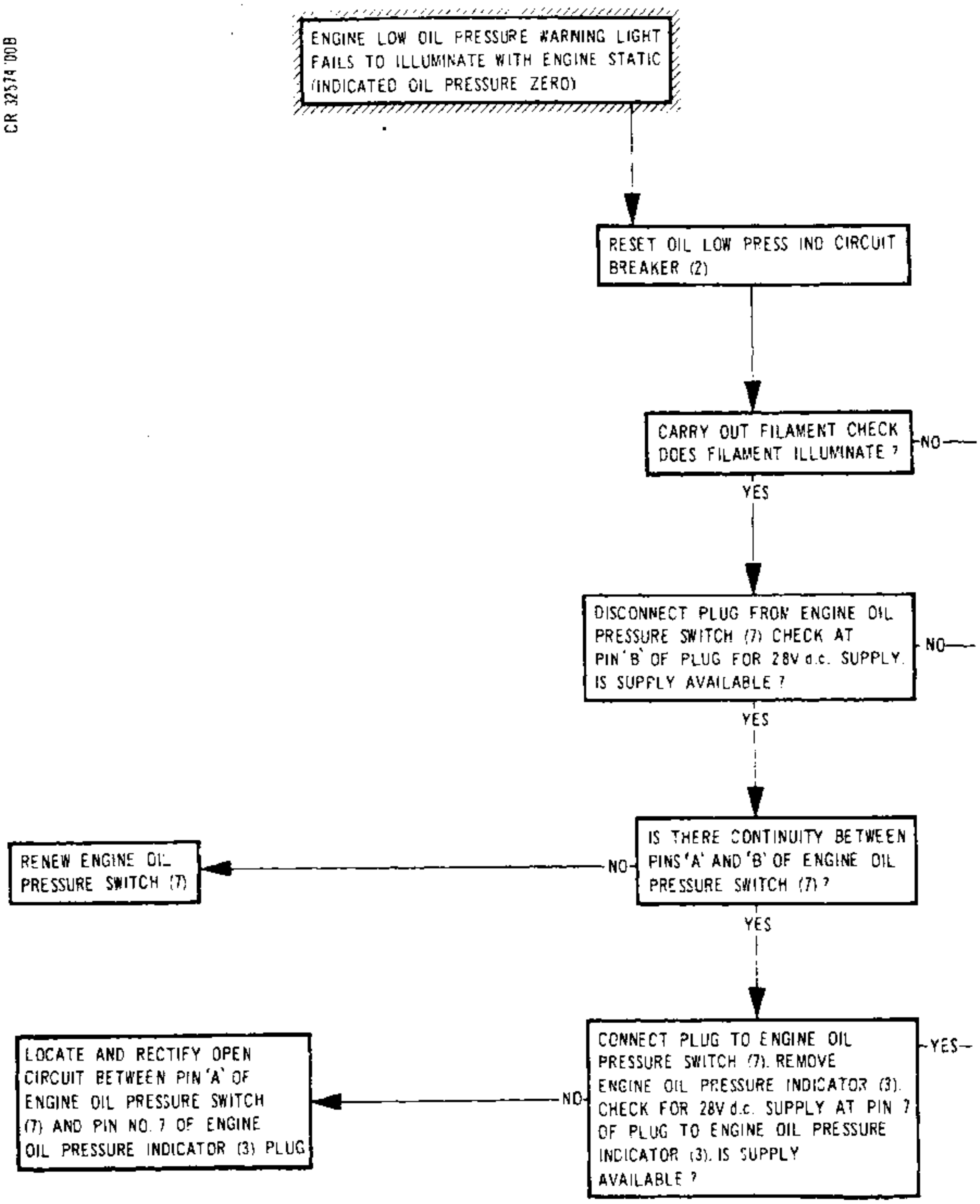
Chart 104 (Sheet 1 of 2)

CR 32577/00B



CMR 71 00 44 1 0AMB

Chart 104 (Sheet 2 of 2)



CR 32574 '00B

CMR 71 00 44 1 EAMA

Chart 105 (Sheet 1 of 2)

CR 32575 00B

CMR 71 00 44 1 EAMB

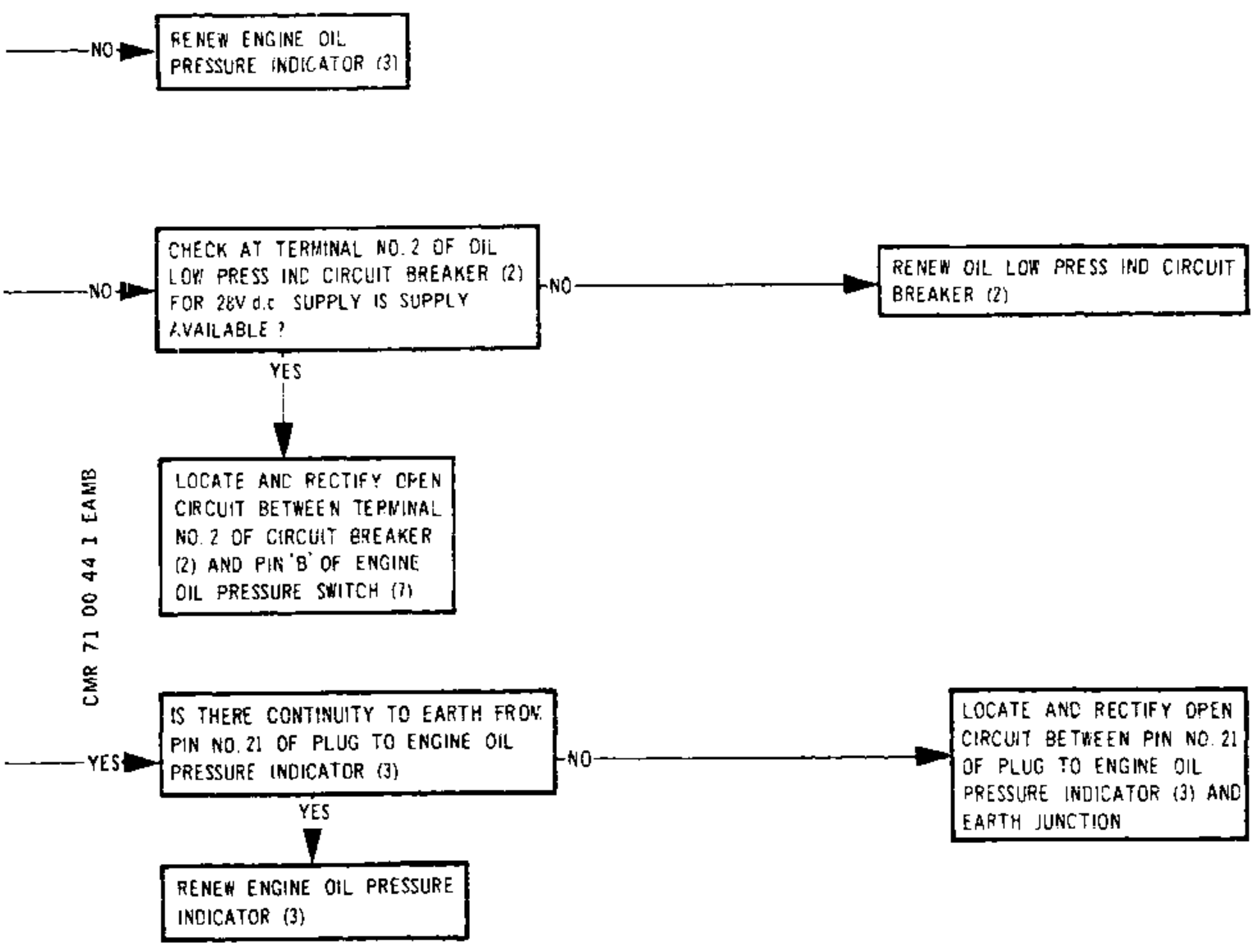


Chart 105 (Sheet 2 of 2)

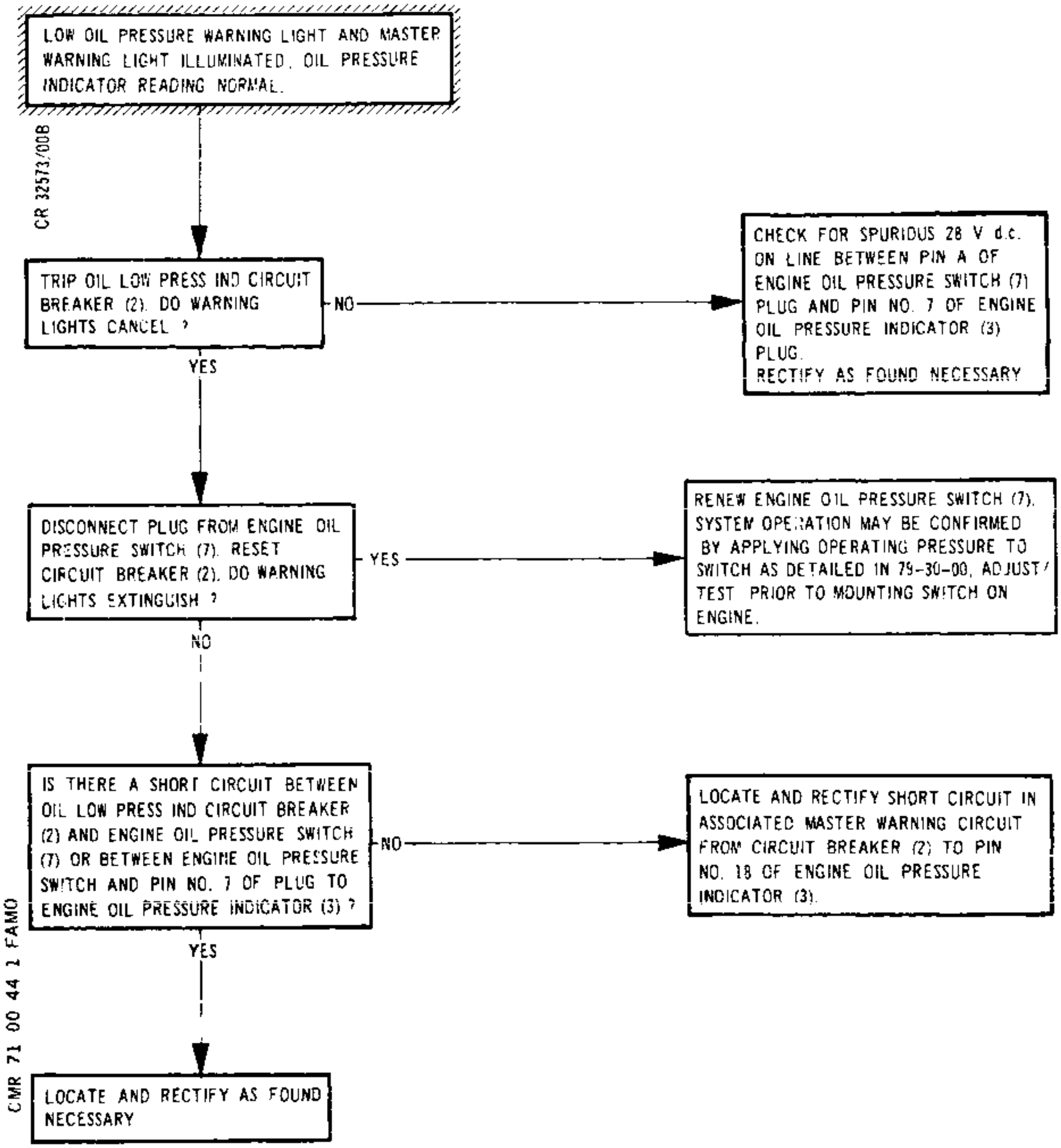
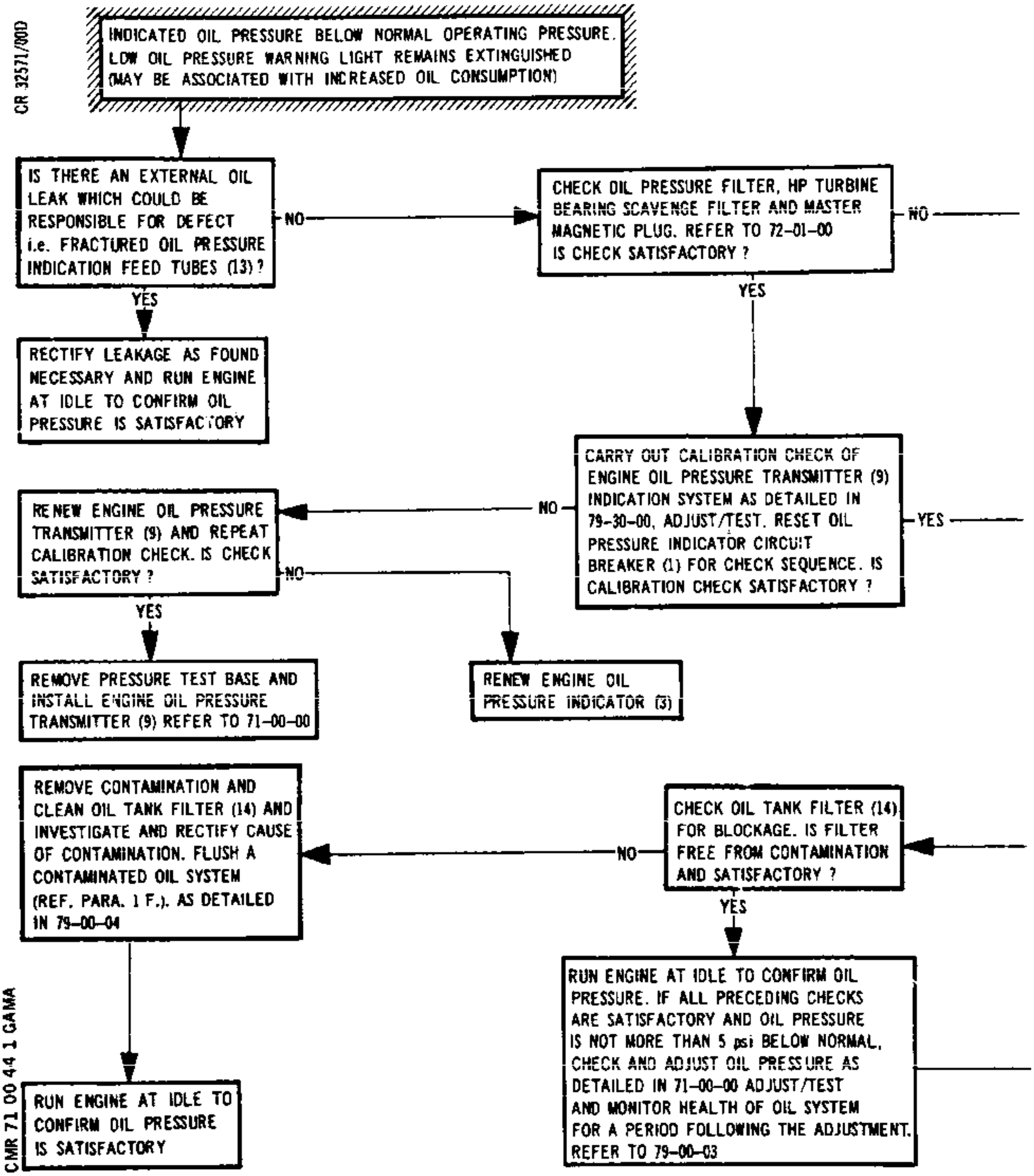

LOW OIL PRESSURE WARNING LIGHT AND MASTER WARNING LIGHT ILLUMINATED. OIL PRESSURE INDICATOR READING NORMAL.
CR 32573/00B
TRIP OIL LOW PRESS IND CIRCUIT BREAKER (2). DO WARNING LIGHTS CANCEL ?
NO
CHECK FOR SPURIOUS 28 V d.c. ON LINE BETWEEN PIN A OF ENGINE OIL PRESSURE SWITCH (7) PLUG AND PIN NO. 7 OF ENGINE OIL PRESSURE INDICATOR (3) PLUG.
RECTIFY AS FOUND NECESSARY
YES
DISCONNECT PLUG FROM ENGINE OIL PRESSURE SWITCH (7). RESET CIRCUIT BREAKER (2). DO WARNING LIGHTS EXTINGUISH ?
YES
RENEW ENGINE OIL PRESSURE SWITCH (7). SYSTEM OPERATION MAY BE CONFIRMED BY APPLYING OPERATING PRESSURE TO SWITCH AS DETAILED IN 79-30-00, ADJUST/TEST PRIOR TO MOUNTING SWITCH ON ENGINE.
NO
IS THERE A SHORT CIRCUIT BETWEEN OIL LOW PRESS IND CIRCUIT BREAKER (2) AND ENGINE OIL PRESSURE SWITCH (7) OR BETWEEN ENGINE OIL PRESSURE SWITCH AND PIN NO. 7 OF PLUG TO ENGINE OIL PRESSURE INDICATOR (3) ?
NO
LOCATE AND RECTIFY SHORT CIRCUIT IN ASSOCIATED MASTER WARNING CIRCUIT FROM CIRCUIT BREAKER (2) TO PIN NO. 18 OF ENGINE OIL PRESSURE INDICATOR (3).
YES
LOCATE AND RECTIFY AS FOUND NECESSARY
CMR 71 00 44 1 FAMO

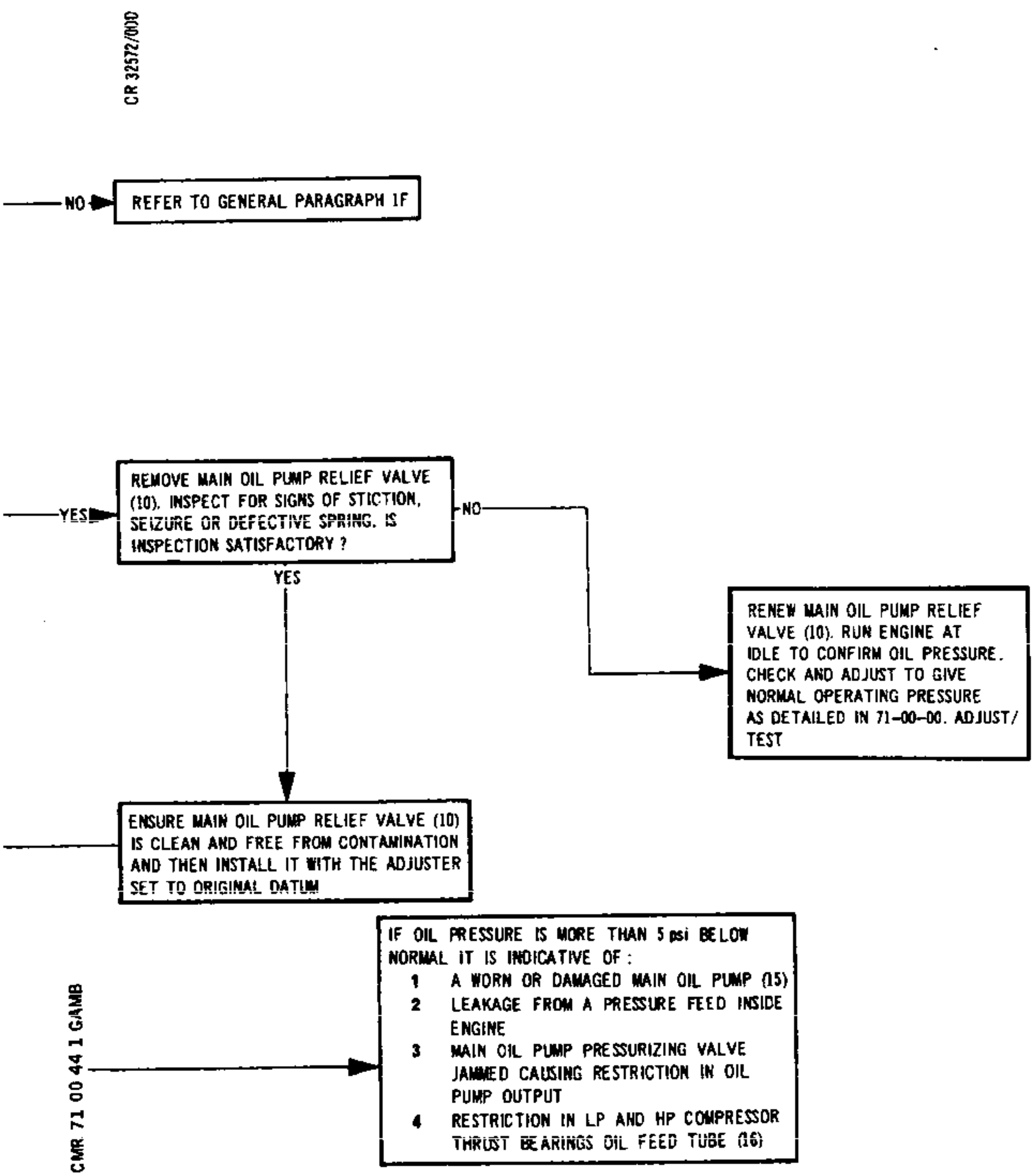
Chart 106

CR 32571/80D

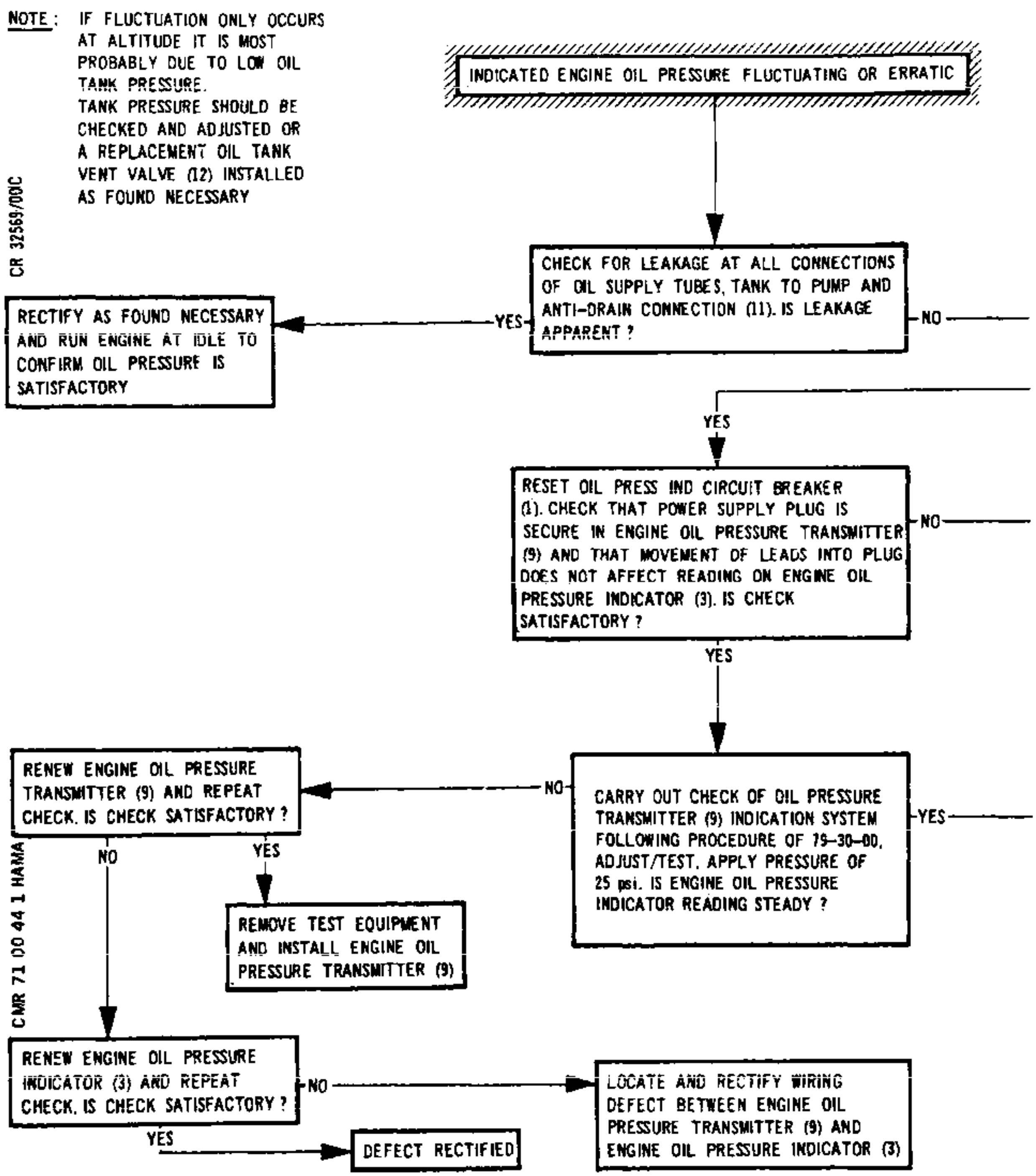


CMR 71 00 44 1 GAMA

R Chart 107 (Sheet 1 of 2) B



R Chart 107 (Sheet 2 of 2) B

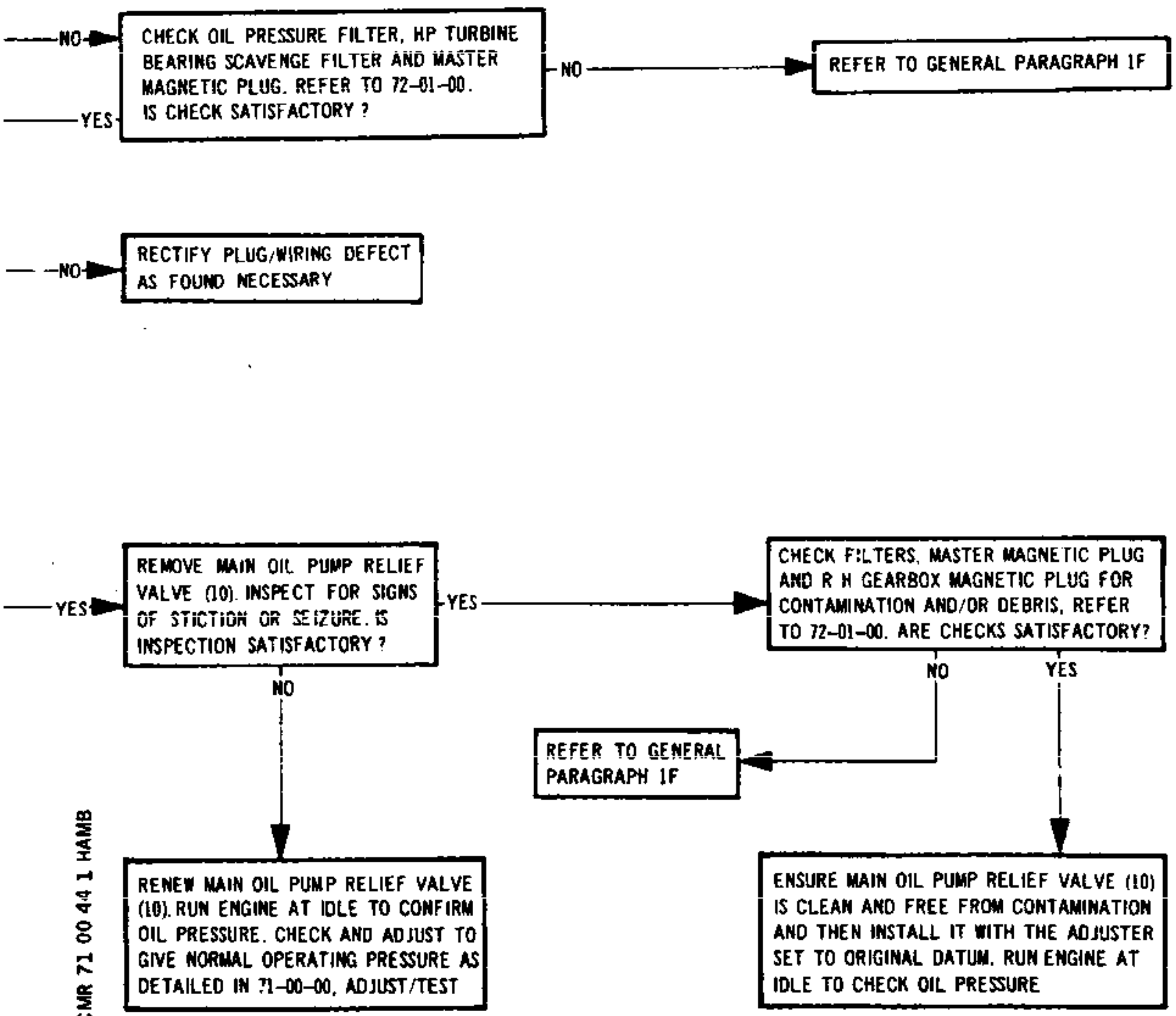


CR 32569/00C

CMR 71 00 44 1 HAMA

R Chart 108 (Sheet 1 of 2) B

CR 32570/00D



CMR 71 00 44 1 HAMB

R Chart 108 (Sheet 2 of 2) B

NOTE: NORMALLY THERE IS AN INDICATED INCREASE OF APPROX. 3 psi WHEN THE ENGINE rpm IS INCREASED FROM IDLING TO MAX. SHOULD THERE BE A LARGE INCREASE IN PRESSURE AS THE rpm IS INCREASED IT IS INDICATIVE OF
(a) DEFECTIVE ENGINE OIL PRESSURE TRANSMITTER (9).
(b) A SEIZED MAIN OIL PUMP RELIEF VALVE (10).
(c) DATUM AIR PASSAGE TO TRANSMITTER OR OIL PUMP RELIEF VALVE BLOCKED.

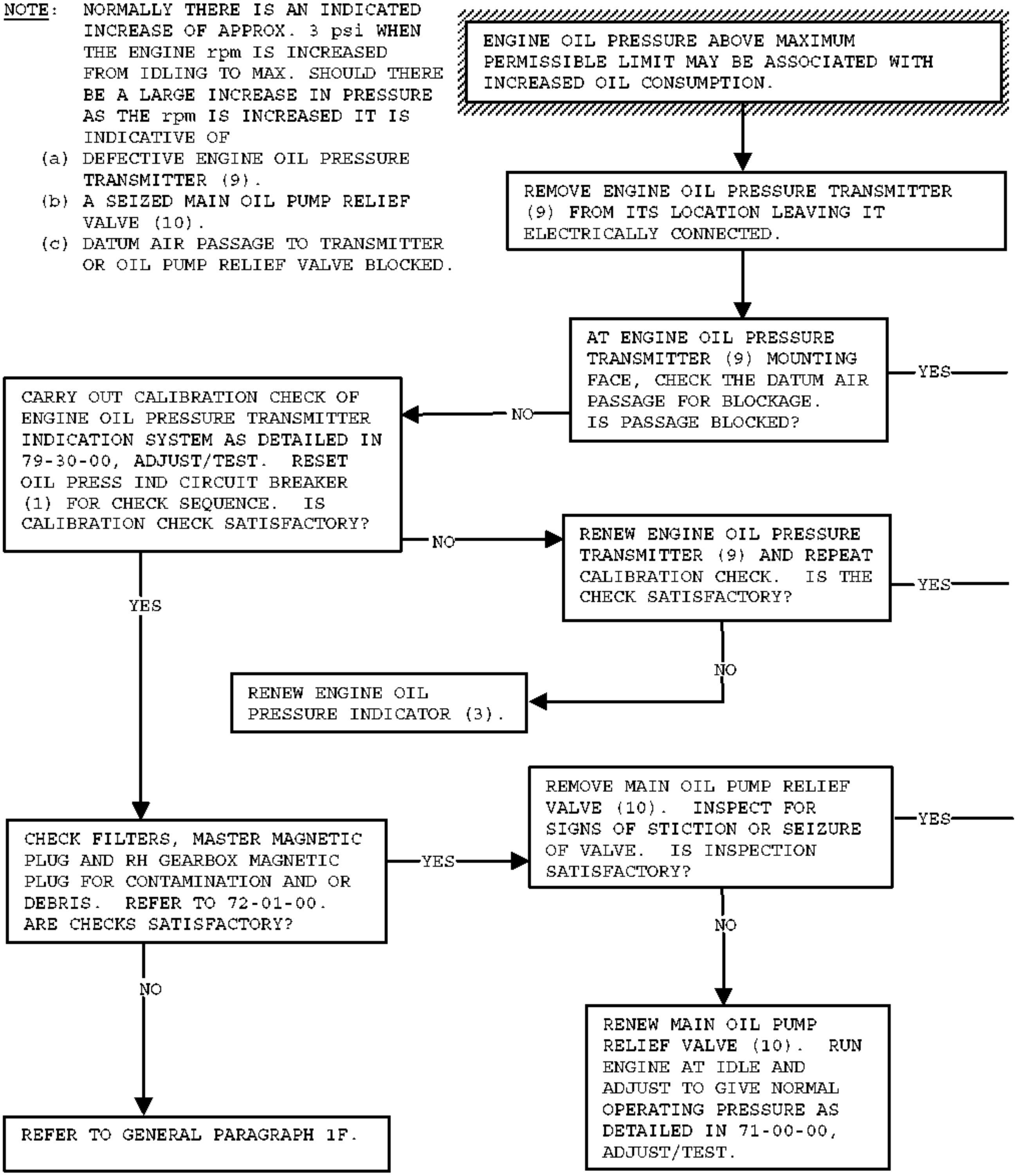


Chart 109 (Sheet 1 of 2)

YES → BLOCKAGE PROBABLE CAUSE OF INDICATED HIGH PRESSURE. RECTIFY BLOCKAGE AS FOUND NECESSARY. INSTALL ENGINE OIL PRESSURE TRANSMITTER (9) AND RUN ENGINE AT IDLE TO CONFIRM OIL PRESSUE IS SATISFACTORY.

YES → REMOVE TEST BASE AND INSTALL ENGINE OIL PRESSURE TRANSMITTER (9).

YES → ENSURE MAIN OIL PUMP RELIEF VALVE (10) IS CLEAN AND FREE FROM CONTAMINATION AND THEN INSTALL IT WITH THE ADJUSTER SET TO ORIGINAL DATUM. IF ALL PRECEDING CHECKS ARE SATISFACTORY AND OIL PRESSURE IS NOT MORE THAN 5 psi ABOVE NORMAL, RESET OIL PRESSURE (REF. 71-00-30, ADJUST/TEST) AND MONITOR OIL SYSTEM HEALTH FOR A SUITABLE PERIOD FOLLOWING THE ADJUSTMENT. REFER TO 79-00-03.

↓

IF OIL PRESSURE IS MORE THAN 5 psi ABOVE NORMAL IT IS INDICATIVE OF
(1) RESTRICTION IN PASSAGES TO OR FROM OIL PUMP RELIEF VALVE
(2) BROKEN SPRING IN OIL PUMP PRESSURIZING VALVE. THIS DEFECT WILL ALSO RESULT IN OIL DISCHARGE FROM HP AND LP TURBINE BEARINGS COLD VENT ON RUNDOWN.

Chart 109 (Sheet 2 of 2)

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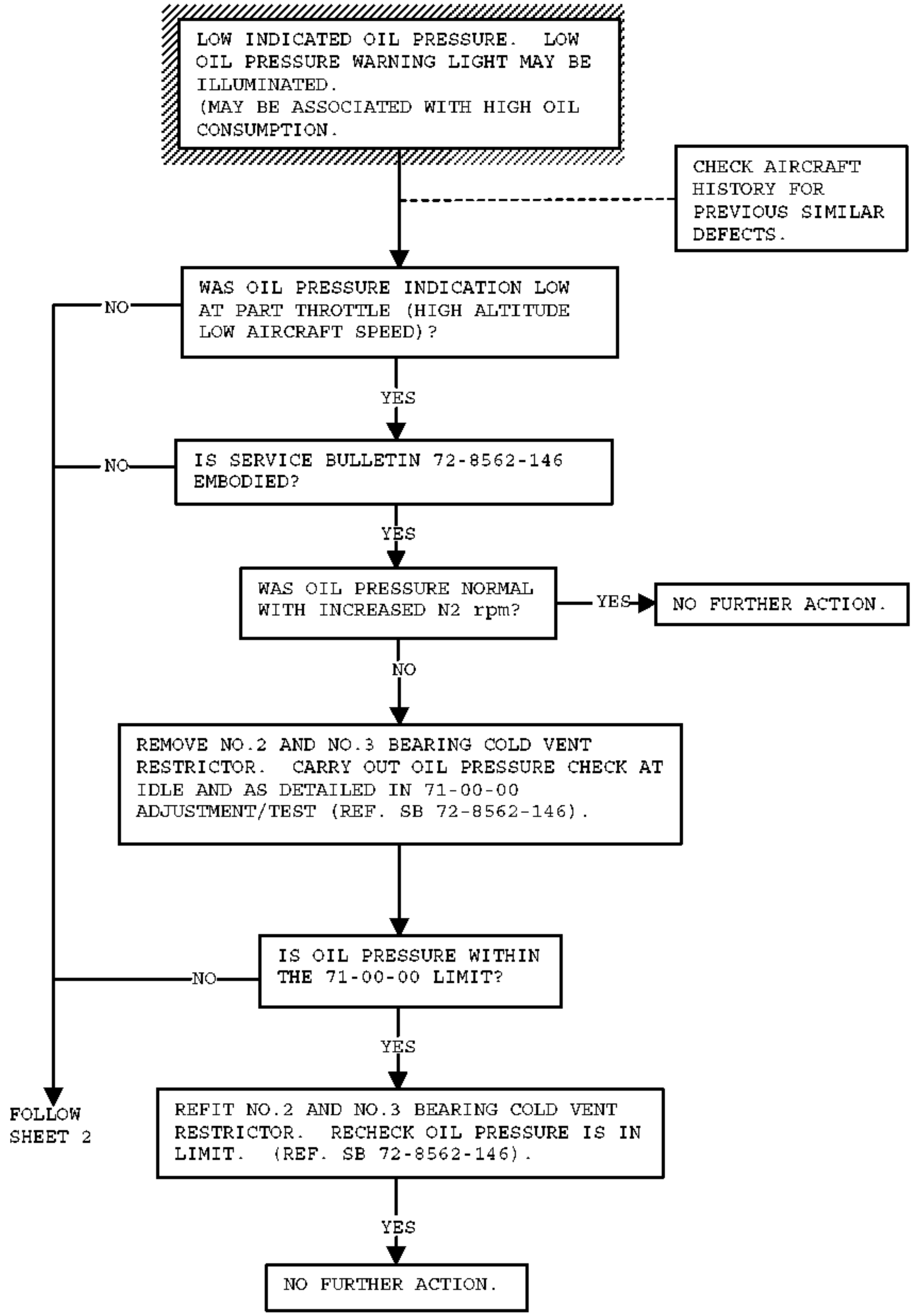

Chart 110 (Sheet 1 of 4)

NOTE 1: FAILURE OF DRIVE TO OIL PUMP OR A BROKEN BEARING FAILURE WARNING PROBE RESULT IN AN OIL PRESSURE BELOW 5 psi.

NOTE 2: FAILURE OF THE MAIN OIL PUMP TO REPRIME FOLLOWING A NEGATIVE G APPLICATION IS MOST PROBABLY DUE TO THE OIL PUMP LOW SPEED BLEED PASSAGE BEING BLOCKED OR LOW OIL TANK PRESSURE.

LOW INDICATED OIL PRESSURE WITH LOW OIL PRESSURE WARNING LIGHT ILLUMINATED. MAY BE ASSOCIATED WITH HIGH OIL CONSUMPTION.

IS THERE AN EXTERNAL OIL LEAK WHICH COULD BE RESPONSIBLE FOR DEFECT eg FRACTURED OIL PRESSURE INDICATION FEED TUBES (13)?

YES

NO

CHECK OIL PRESSURE FILTER IN ACCORDANCE WITH 72-01-00 SERVICING AND H.P. TURBINE BEARING SCAVENGE FILTER. IS THERE EVIDENCE OF A BLOCKED FILTER?

YES

NO

CHECK OIL TANK FILTER (14) FOR BLOCKAGE. IS FILTER BLOCKED.

YES

NO

CHECK MASTER MAGNETIC PLUG FOR DEBRIS. REFER TO 72-01-00. IS CHECK SATISFACTORY?

NO

YES

REMOVE MAIN OIL PUMP RELIEF VALVE (10). INSPECT FOR SIGNS OF STICTION, SEIZURE OR DEFECTIVE SPRING. IS INSPECTION SATISFACTORY?

NO

YES

ENSURE MAIN OIL PUMP RELIEF VALVE (10) IS CLEAN AND FREE FROM CONTAMINATION AND THEN INSTALL IT WITH THE ADJUSTER SET TO ORIGINAL DATUM.

REMOVE CONTAMINATION AND CLEAN OIL TANK FILTER (14) AND INVESTIGATE AND RECTIFY CAUSE OF CONTAMINATION (REF. PARA. 1.F. OF THIS CHAPTER). FLUSH A CONTAMINATED OIL SYSTEM AS DETAILED IN 79-00-04.

RUN ENGINE AT IDLE TO CONFIRM OIL PRESSURE IS SATISFACTORY.

INVESTIGATE FAILURE OF DRIVE TO MAIN OIL PUMP (15) AND RECTIFY AS FOUND NECESSARY.

NO

Chart 110 (Sheet 2 of 4)

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YES → RECTIFY OIL LEAKS AS NECESSARY. CARRY OUT RECOMMISSIONING DRILL AS DETAILED UNDER ACTION REQD. FOLLOWING ENGINE SHUTDOWN IN FLIGHT. REF. 71-00-00 INSP/CHECK.

YES → INVESTIGATE BLOCKAGE AND TAKE ACTION AS CONSIDERED NECESSARY INCLUDING CHECK OF SCAVENGE FILTERS. REMOVE CONTAMINATION AND CLEAN FILTER BEFORE INSTALLATION (REF. PARA.1.F. OF THIS CHAPTER). FLUSH A CONTAMINATED OIL SYSTEM AS DETAILED IN 79-00-04.

NO → REFER TO PARAGRAPH 1.F. OF THIS CHAPTER

NO → RENEW MAIN OIL PUMP RELIEF VALVE (10). RUN ENGINE AT IDLE TO CONFIRM OIL PRESSURE. CHECK AND ADJUST TO NORMAL OPERATING PRESSURE AS DETAILED IN 71-00-00. ADJUST/TEST.

→ DISCONNECT LP COMPRESSOR FRONT BEARING OIL FEED TUBE (16) AT AIR INTAKE CASE AND ALLOW OIL TO DRAIN. CHECK THAT OIL TANK CONTENTS IS AT LEAST 6 LITRES. CARRY OUT DRY MOTORING. IS THERE A FREE FLOW OF OIL FROM THE FEED TUBE (16) DURING MOTORING CYCLE.

YES → INDICATES OIL PUMP IS SATISFACTORY AND THAT BEARING FAILURE WARNING PROBE HAS BEEN BROKEN IN THE INTERMEDIATE CASE. REMOVE ENGINE FOR RECTIFICATION.

NO → REMOVE MAIN OIL PUMP (15). CHECK ENGINE DRIVE TO MAIN OIL PUMP. IS DRIVE SATISFACTORY?

YES → RENEW MAIN OIL PUMP (15). RUN ENGINE AT IDLE AND CONFIRM OIL PRESSURE. CHECK AND ADJUST TO NORMAL OPERATING PRESSURE AS DETAILED IN 71-00-00 ADJUST/TEST.

NO ←

Chart 110 (Sheet 3 of 4)

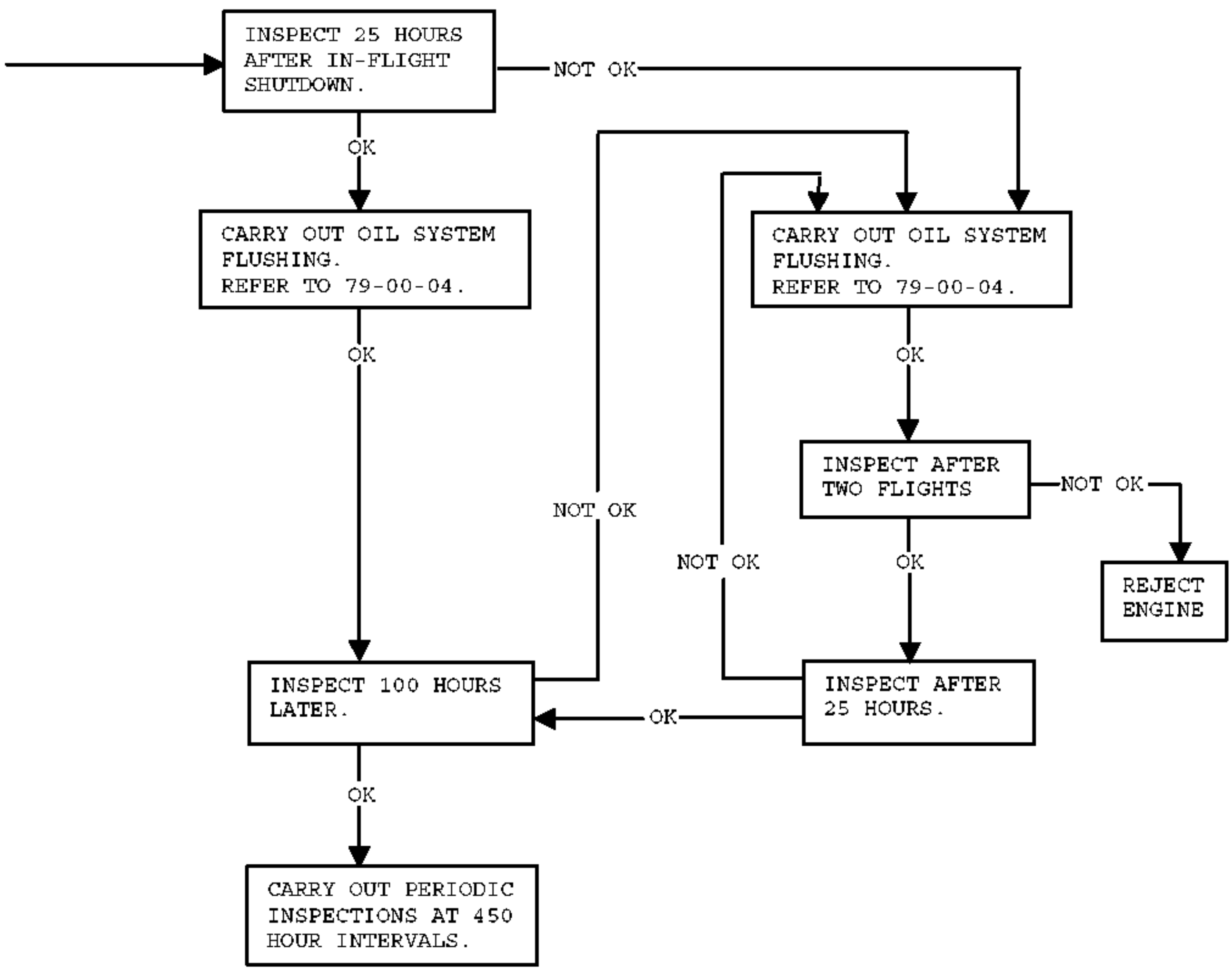

Chart 110 (Sheet 4 of 4)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1						
(1) Circuit breaker 115 V	-	14-215	1E65	Map Ref. C14		
(2) Circuit breaker 28 V	-	5-213	1E61	Map Ref. A1		
(3) Engine oil pressure indicator	-	4-214	1E66	-	79-30-00	
(4) Master warning test switch	-	4-214	E67	-	79-30-00	
(5) Junction block	-	533	UG5029 (2)	-	79-30-00	
(6) Oil tank contents transmitter and overfull switch	-	415	-	-	79-31-01	
(7) Engine oil pressure switch	-	415/416	-	-	79-33-02	
(8) Oil contents and temperature indicator	-	4-214	1E233	-	79-30-00	
(9) Engine oil pressure transmitter	-	415-416	-	-	79-33-01	
(10) Main oil pump relief valve	-	415	-	-	72-65-00	
(11) Oil supply tubes, tank to pump and anti-drain connection	-	415	-	-	79-22-01	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(12) Oil tank vent valve	-	415	-	-	79-11-01	
(13) Oil pressure indication feed tubes	-	415/416	-	-	72-01-03	
(14) Oil tank filter	-	415	-	-	79-11-01	
(15) Main oil pump	-	415	-	-	72-65-00	
(16) LP and HP compressor thrust bearings oil feed tube	-	415/416	-	-	72-01-03	
ENGINE NO.2						
(1) Circuit breaker 115 V	-	13-215	2E65	Map Ref. C13		
(2) Circuit breaker 28 V	-	1-213	2E61	Map Ref. C5		
(3) Engine oil pressure indicator	-	4-214	2E66	-	79-30-00	
(4) Master warning test switch	-	4-214	E67	-	79-30-00	
(5) Junction block	-	534	UG5023 (2)	-	79-30-00	
(6) Oil tank contents transmitter and overfull switch	-	425	-	-	79-31-01	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(7) Engine oil pressure switch	-	425/426	-	-	79-33-02	
(8) Oil contents and oil temperature indicator	-	4-214	2E233	-	79-30-00	
(9) Engine oil pressure transmitter	-	425/426	-	-	79-33-01	
(10) Main oil pump relief valve	-	425	-	-	72-65-00	
(11) Oil supply tubes, tank to pump and anti-drain connection	-	425	-	-	79-22-01	
(12) Oil tank vent valve	-	425	-	-	79-11-01	
(13) Oil pressure indication feed tubes	-	425/426	-	-	72-01-03	
(14) Oil tank filter	-	425	-	-	79-11-01	
(15) Main oil pump	-	425	-	-	72-65-00	
(16) LP and HP compressor thrust bearings oil feed tube	-	425/426	-	-	72-01-03	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.3						
(1) Circuit breaker 115 V	-	13-216	3E65	Map Ref. B7		
(2) Circuit breaker 28 V	-	1-213	3E61	Map Ref. C6		
(3) Engine oil pressure indicator	-	4-214	3E66	-	79-30-00	
(4) Master warning test switch	-	4-214	E67	-	79-30-00	
(5) Junction block	-	634	UG6023 (2)	-	79-30-00	
(6) Oil tank contents transmitter and overfull switch	-	435	-	-	79-31-01	
(7) Engine oil pressure switch	-	435/436	-	-	79-33-02	
(8) Oil contents and oil temperature indicator	-	4-214	3E233	-	79-30-00	
(9) Engine oil pressure transmitter	-	435/436	-	-	79-33-01	
(10) Main oil pump relief valve	-	435	-	-	72-65-00	
(11) Oil supply tubes, tank to pump and anti-drain connection	-	435	-	-	79-22-01	

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ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(12) Oil tank vent valve	-	435	-	-	79-11-01	
(13) Oil pressure indication feed tubes		435/436	-	-	72-01-03	
(14) Oil tank filter	-	435	-	-	79-11-01	
(15) Main oil pump	-	435	-	-	72-65-00	
(16) LP and HP compressor thrust bearings oil feed tube	-	435/436	-	-	72-01-03	
ENGINE NO.4						
(1) Circuit breaker 115 V	-	14-216	4E65	Map Ref. D6		
(2) Circuit breaker 28 V	-	5-213	4E61	Map Ref. A2		
(3) Engine oil pressure indicator	-	4-214	4E66	-	79-30-00	
(4) Master warning test switch	-	4-214	E67	-	79-30-00	
(5) Junction block	-	633	UG6029 (2)	-	79-30-00	
(6) Oil tank contents transmitter and overfull switch	-	445	-	-	79-31-01	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(7) Engine oil pressure switch	-	445/446	-	-	79-33-02	
(8) Oil contents and oil temperature indicator	-	4-214	4E233	-	79-30-00	
(9) Engine oil pressure transmitter	-	445/446	-	-	79-33-01	
(10) Main oil pump relief valve	-	445	-	-	72-65-00	
(11) Oil supply tubes, tank to pump and anti-drain connection	-	445	-	-	79-22-01	
(12) Oil tank vent valve	-	445	-	-	79-11-01	
(13) Oil pressure indication feed tubes		445/446	-	-	72-01-03	
(14) Oil tank filter	-	445	-	-	79-11-01	
(15) Main oil pump	-	445	-	-	72-65-00	
(16) LP and HP compressor thrust bearing oil feed tube	-	445/446	-	-	72-01-03	

Component Identification
Table 101

OIL TEMPERATURE - TROUBLE SHOOTING

1. General

A. The oil temperature system comprises an indicator and a platinum wire resistance type thermometer located in the oil supply tube (tank to pump). The relationship between temperature and resistance is shown in the illustration (Ref. Fig. 101). The power supply to the system is the same as that for oil contents indication, the high temperature warning light being activated by the same circuitry that drives the oil temperature indicator pointer.

B. Should low oil temperature be experienced it is most probably due to an indication defect and therefore the oil temperature indicator should be calibrated. If calibration is satisfactory, renew the oil inlet thermometer.

C. Where a defect is proved to be in the basic oil or lubrication systems, the spectrometric oil analysis and magnetic plug records should, whenever possible, be examined as they may provide assistance in locating or confirming the specific defect.

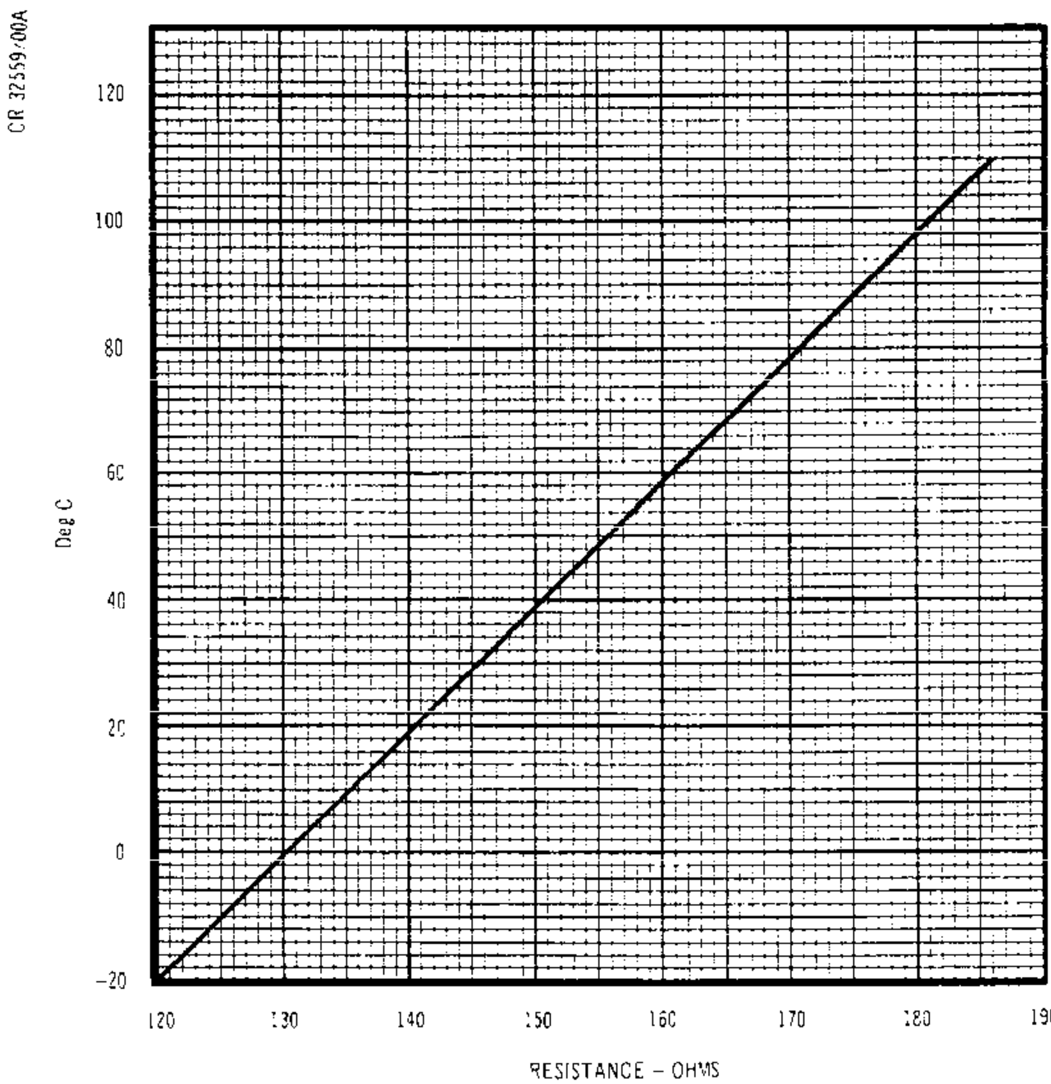
D. Contamination of filters and magnetic plugs will fall into three categories, i.e.normal, above normal but considered satisfactory for further flight with additional monitoring as considered necessary, and sufficient contamination to warrant rectification action before further flight.

When contamination in the last category is encountered, and it is considered safe and unlikely to cause further damage, in view of the modular construction of the engine, the following should be considered: installing clean filters and master magnetic plug, also additional magnetic plugs then carry out an engine run to establish the section of engine in which the debris is being generated. Information from this check may lead to a simple module change instead of a complete engine strip.

E. Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is detailed in Table 101.

2. Preparation

A. Ensure that external electrical power supply is connected and switched on.



R

Temperature/Resistance Relationship
Figure 101

B. Consult Chart 101 and carry out actions indicated to determine which of the Trouble Shooting charts is applicable.

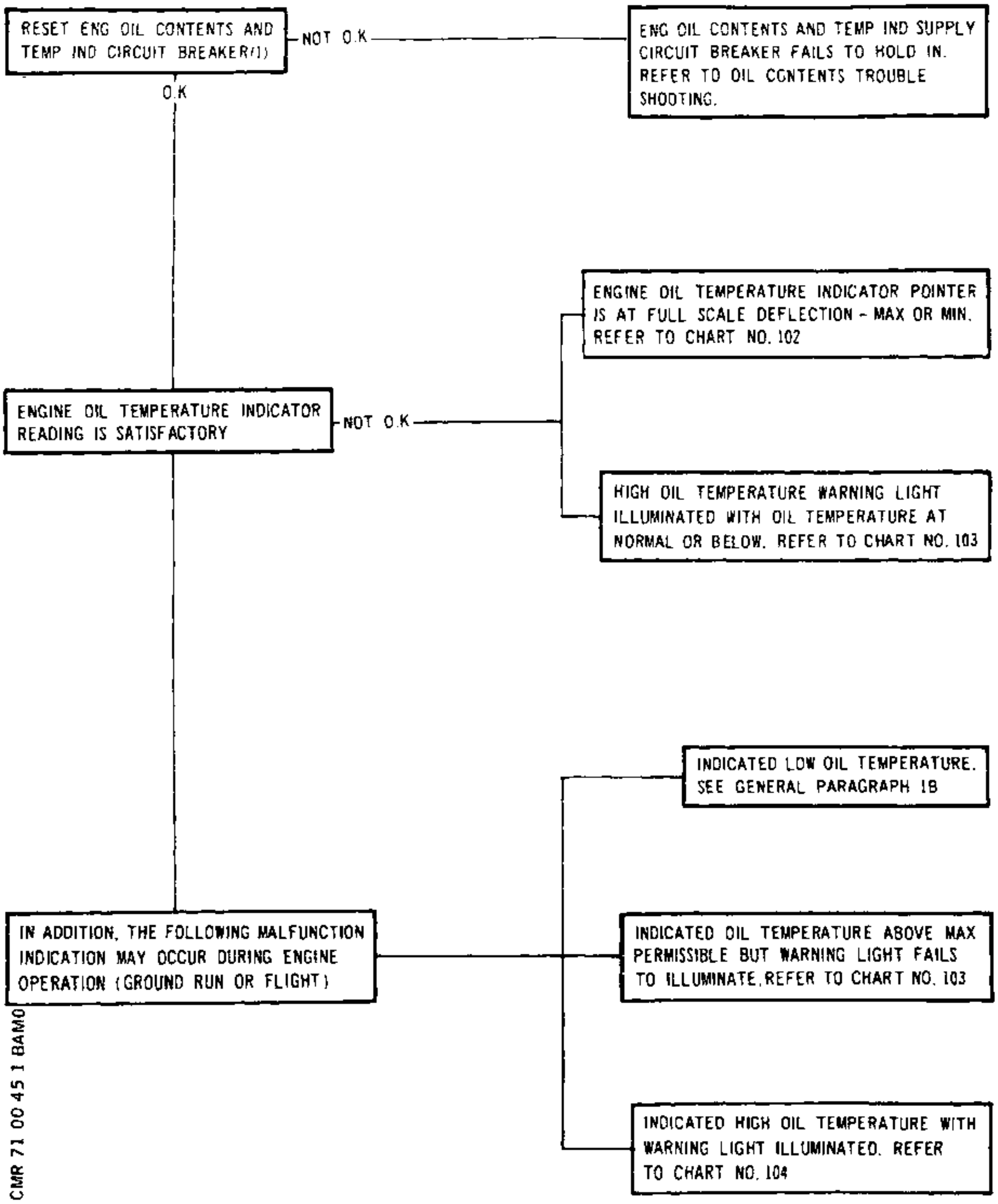

RESET ENG OIL CONTENTS AND TEMP IND CIRCUIT BREAKER(1)
NOT O.K
ENG OIL CONTENTS AND TEMP IND SUPPLY CIRCUIT BREAKER FAILS TO HOLD IN. REFER TO OIL CONTENTS TROUBLE SHOOTING.
O.K
ENGINE OIL TEMPERATURE INDICATOR READING IS SATISFACTORY
NOT O.K
ENGINE OIL TEMPERATURE INDICATOR POINTER IS AT FULL SCALE DEFLECTION - MAX OR MIN. REFER TO CHART NO. 102
HIGH OIL TEMPERATURE WARNING LIGHT ILLUMINATED WITH OIL TEMPERATURE AT NORMAL OR BELOW. REFER TO CHART NO. 103
IN ADDITION, THE FOLLOWING MALFUNCTION INDICATION MAY OCCUR DURING ENGINE OPERATION (GROUND RUN OR FLIGHT)
INDICATED LOW OIL TEMPERATURE. SEE GENERAL PARAGRAPH 1B
INDICATED OIL TEMPERATURE ABOVE MAX PERMISSIBLE BUT WARNING LIGHT FAILS TO ILLUMINATE. REFER TO CHART NO. 103
INDICATED HIGH OIL TEMPERATURE WITH WARNING LIGHT ILLUMINATED. REFER TO CHART NO. 104
CMR 71 00 45 1 BAM0

Chart 101

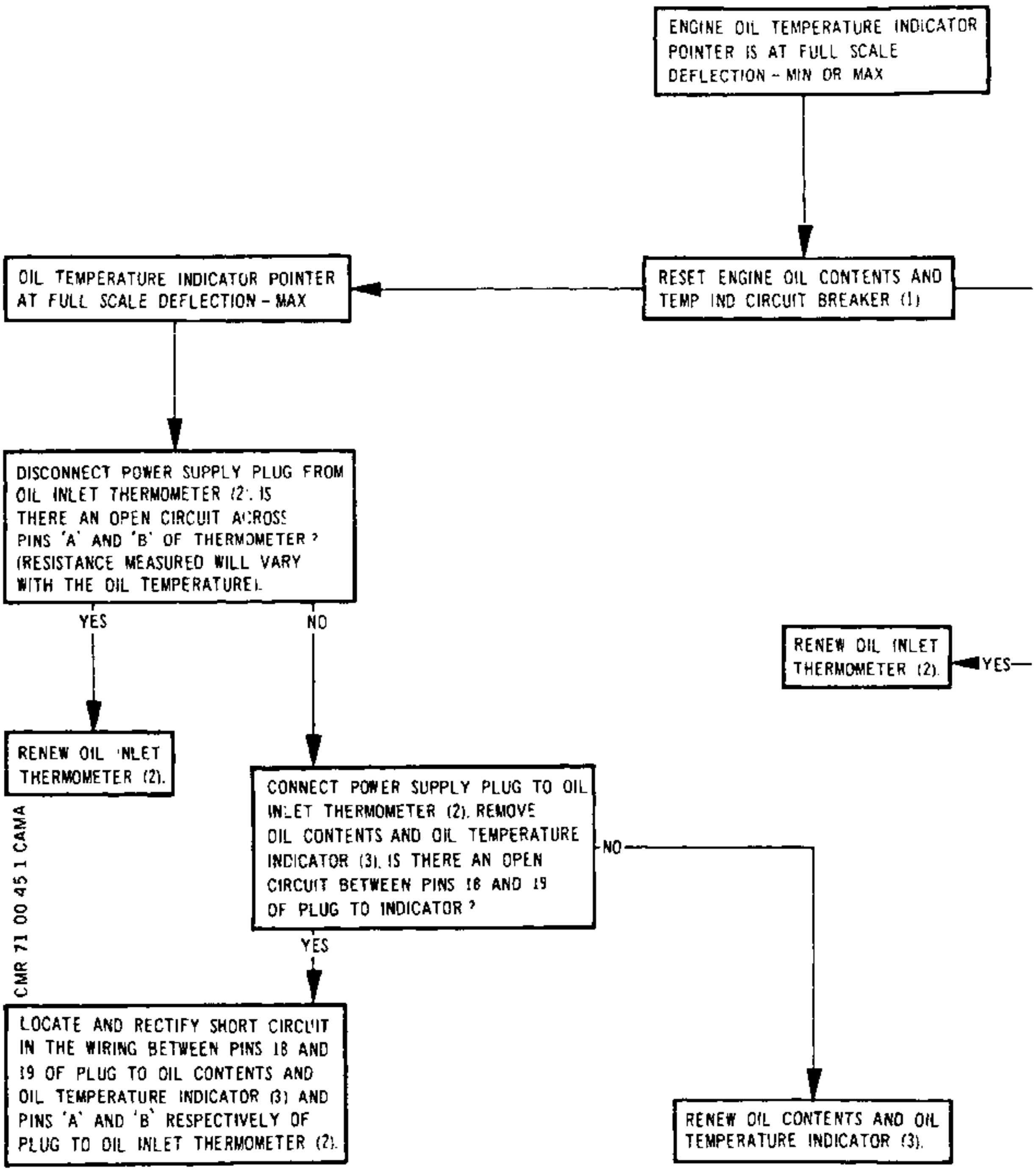
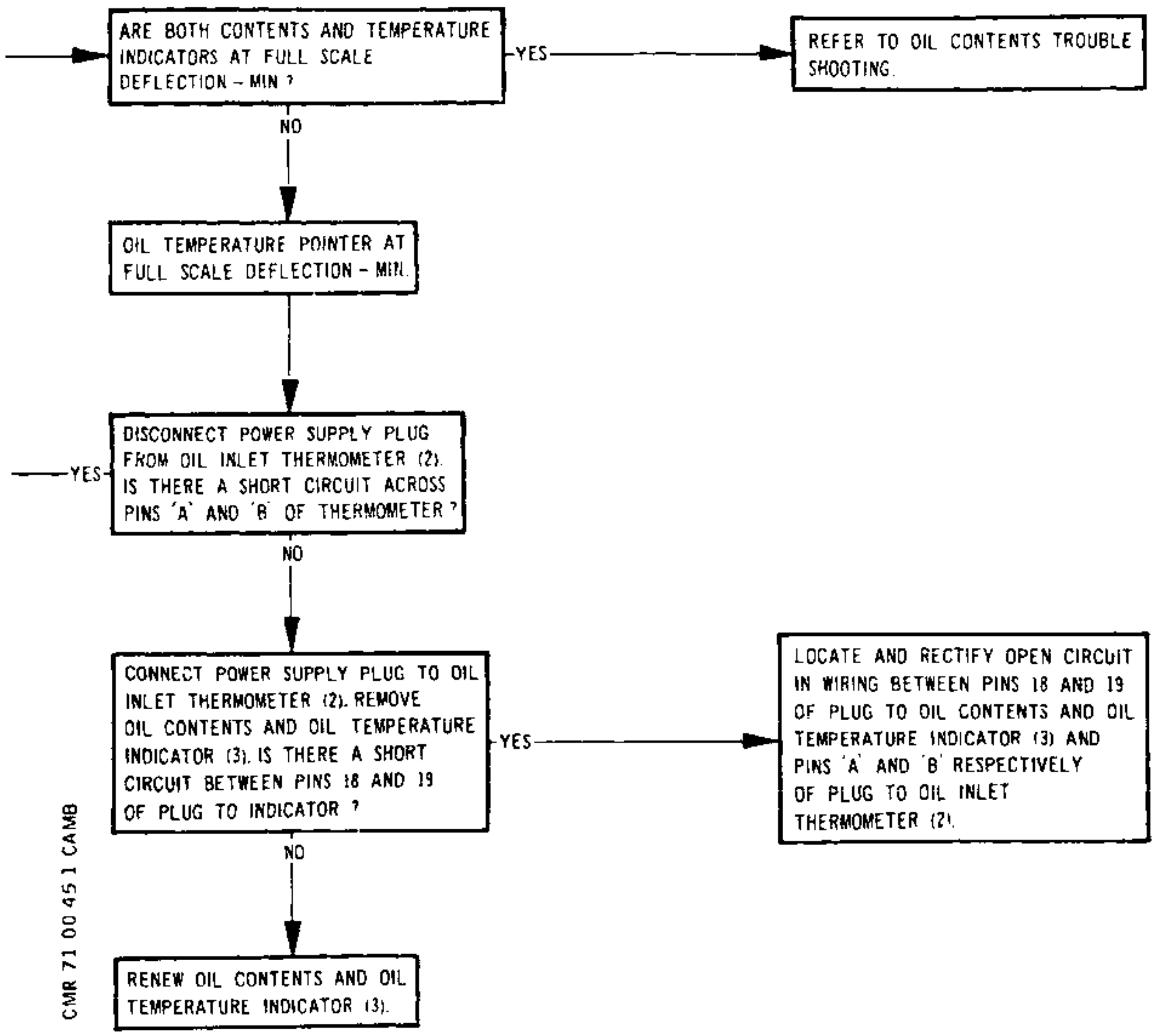


Chart 102 (Sheet 1 of 2)

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (28V d.c.)
MULTI-TEST METEP
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 45 1 CAMB

Chart 102 (Sheet 2 of 2)

GROUND EQUIPMENT

DESCRIPTION

GROUND POWER SUPPLY (28 V d.c.)

CIRCUIT BREAKER SAFETY CLIPS

MULTI-TEST METER

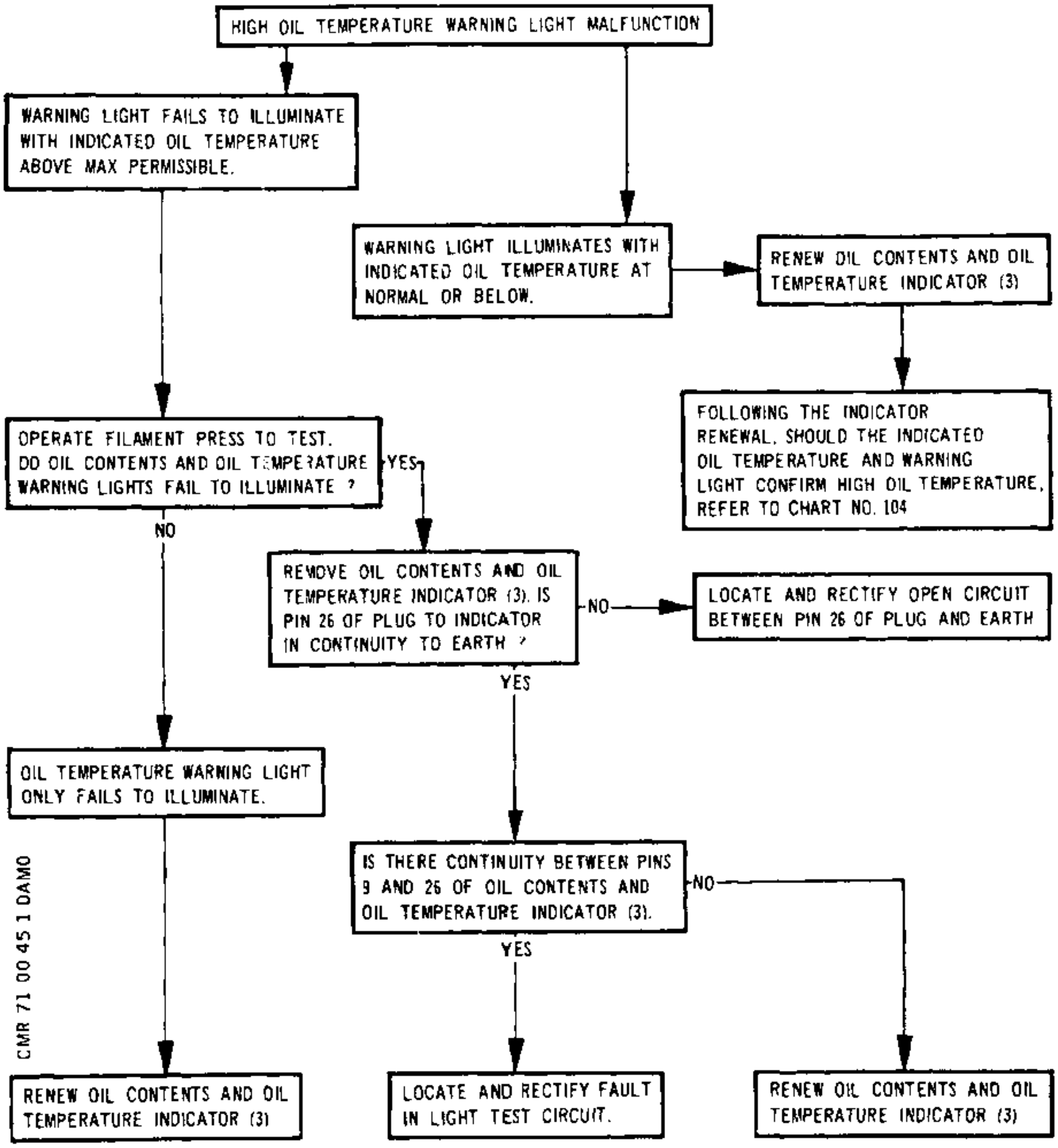
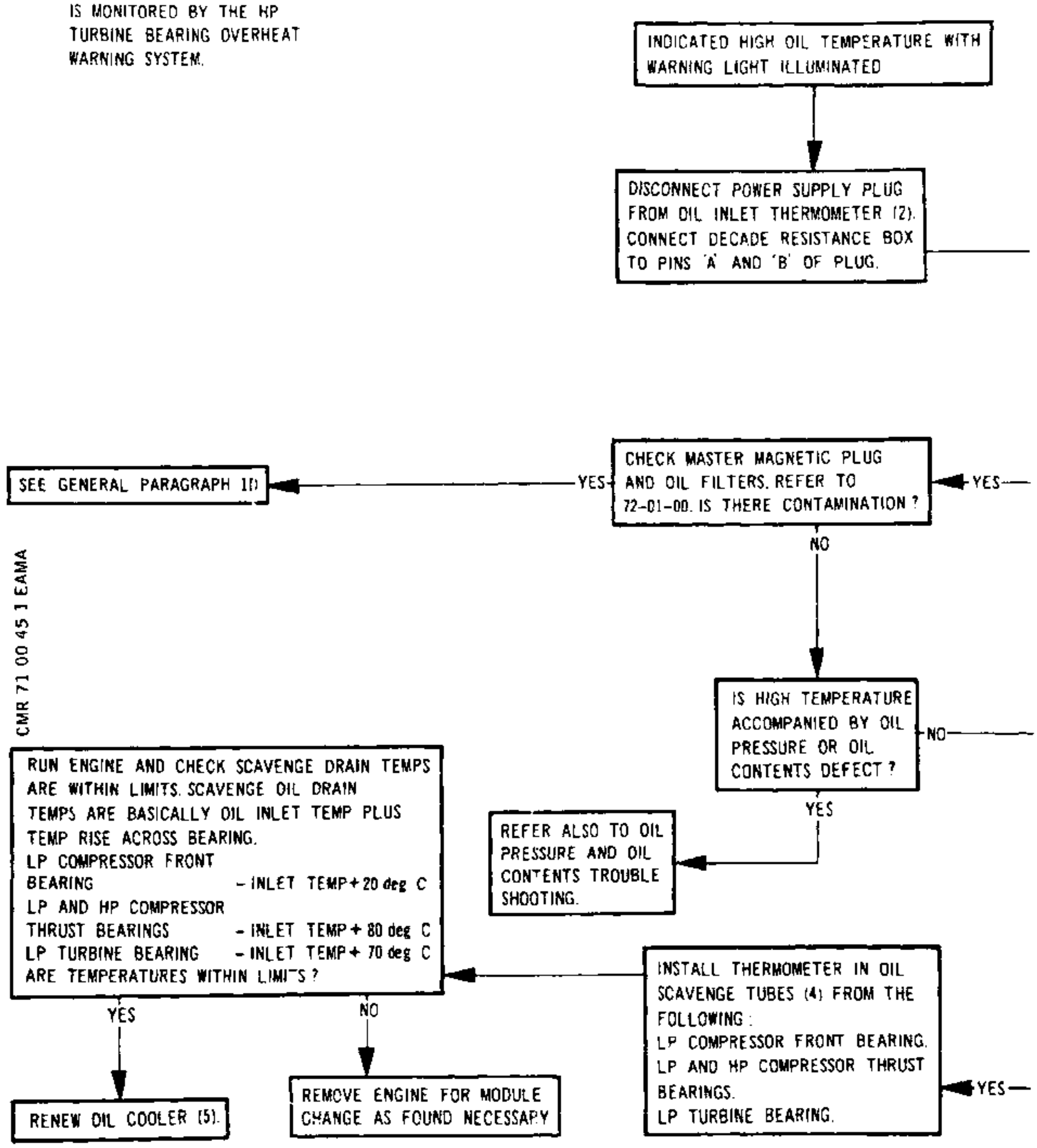


Chart 103

NOTE : THE OIL TEMPERATURE RISE ACROSS HP TURBINE BEARING IS MONITORED BY THE HP TURBINE BEARING OVERHEAT WARNING SYSTEM.



CMR 71 00 45 1 EAMA

Chart 104 (Sheet 1 of 2)

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (28V d.c.)
CIRCUIT BREAKER SAFETY CLIPS.
MULTI-TEST METER.
DECADE RESISTANCE BOX.
SCAVENGE OIL TEMPERATURE
MEASURING EQUIPMENT.

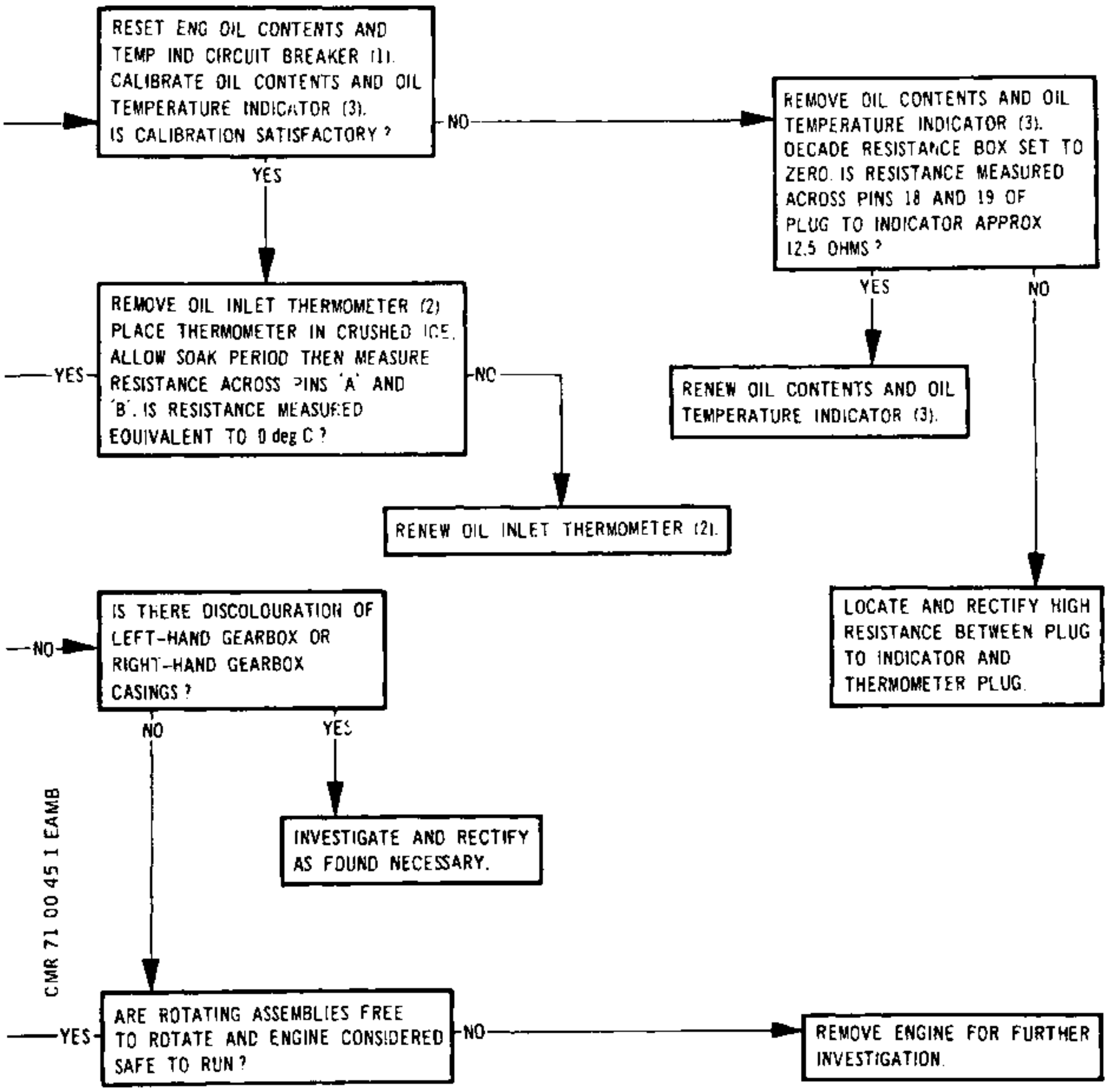


Chart 104 (Sheet 2 of 2)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO. 1						
(1) Circuit breaker 115 V	-	14-215	1E232	Map Ref.D14		
(2) Engine oil inlet therm-ometer	-	415	-	-	79-32-01	
(3) Oil contents and oil temper-ature indicator	-	4-214	1E233	-	79-30-00	
(4) Oil scavenge tubes, bearings to pump	-	415/416	-	-	72-01-04	
(5) Oil cooler	-	415	-	-	79-21-01	
ENGINE NO.2						
(1) Circuit breaker 115 V	-	13-215	2E232	Map Ref.G13		
(2) Engine oil inlet therm-ometer	-	425	-	-	79-32-01	
(3) Oil contents and oil temper-ature indicator	-	4-214	2E233	-	79-30-00	
(4) Oil scavenge tubes, bearings to pump	-	425/426	-	-	72-01-04	
(5) Oil cooler	-	425	-	-	79-21-01	
ENGINE NO. 3						
(1) Circuit breaker 115 V	-	13-216	3E232	Map Ref.D7		
(2) Engine oil inlet therm-	-	435	-	-	79-32-01	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ometer						
(3) Oil contents and oil temperature indicator	-	4-214	3E233	-	79-30-00	
(4) Oil scavenge tubes, bearings to pump	-	435/436	-	-	72-01-04	
(5) Oil cooler	-	435	-	-	79-21-01	
ENGINE NO. 4						
(1) Circuit breaker 115 V	-	14-216	4E232	Map Ref.E6		
(2) Engine oil inlet thermometer	-	445	-	-	79-32-01	
(3) Oil contents and oil temperature indicator	-	4-214	4E233	-	79-30-00	
(4) Oil scavenge tubes, bearings to pump	-	445/446	-	-	72-01-04	
(5) Oil cooler	-	445	-	-	79-21-01	

Component Identification
Table 101

LP COMPRESSOR OVERSPEED CONTROL - TROUBLE SHOOTING

1. General

A. The LP compressor overspeed control system comprises a low speed governor amplifier, a solenoid in the electro pressure control (LPC) of the flow control unit, and coil number 5 of the LP compressor speed probe. It is designed to restrict the maximum N1 to 110% in the event of an engine control system malfunction.

B. When the operating point within the low speed governor amplifier is reached, the unit commences to exercise its authority over the solenoid operated valve in the flow control unit, thus anticipating the requirement to eventually restrict the rpm to the maximum speed to which the amplifier is set.

C. A functional check of the system can be carried out by use of the press-to-test facility. With the engine running, operation of the push button on the front panel of the amplifier unit generates a short duration pulse and gives momentary activation of the LPC. On a serviceable system the resulting restriction of the fuel flow is sufficient to give a noticeable reduction of indicated engine speed and shows that the system is operative.

D. Safety circuits in the amplifier sense faults that would fail to limit fuel in the event of an actual engine overspeed and faults that might reduce fuel to meet a non-existent overspeed when the engine was at normal speed condition. Sensed faults activate the safety circuits and render the unit dormant by inhibiting the output current.

E. A yellow pop-out button on the front face of the LP compressor low speed governor amplifier unlatches and protrudes when the amplifier safety system operates.

R F. When the yellow pop-out button protrudes from the amplifier,
R the LP compressor overspeed governor control system is
R inoperative. The cause of the unlatching must be invest-
R igated prior to engine start or flight in accordance with
R Chart 101.

R G. Overspeed above the value of 105% will be recorded by the overspeed pointer on the N1 rpm indicator until such time as the limit reset button is operated. Overspeeds are assumed to be of a transient nature only.

R H. An inspection to determine the acceptability of the engine for further service must be carried out as detailed for action to be taken following an engine overspeed (Ref.71-00-00, Inspection/Check).

R J. If an engine overtemperature (Ref.71-00-34, Trouble Shooting) has occurred at the same time as the engine overspeed, then the engine must be removed for rectification as detailed in the Heavy Maintenance and Overhaul Manuals.

R K. Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is detailed in Table 101.

2. Preparation

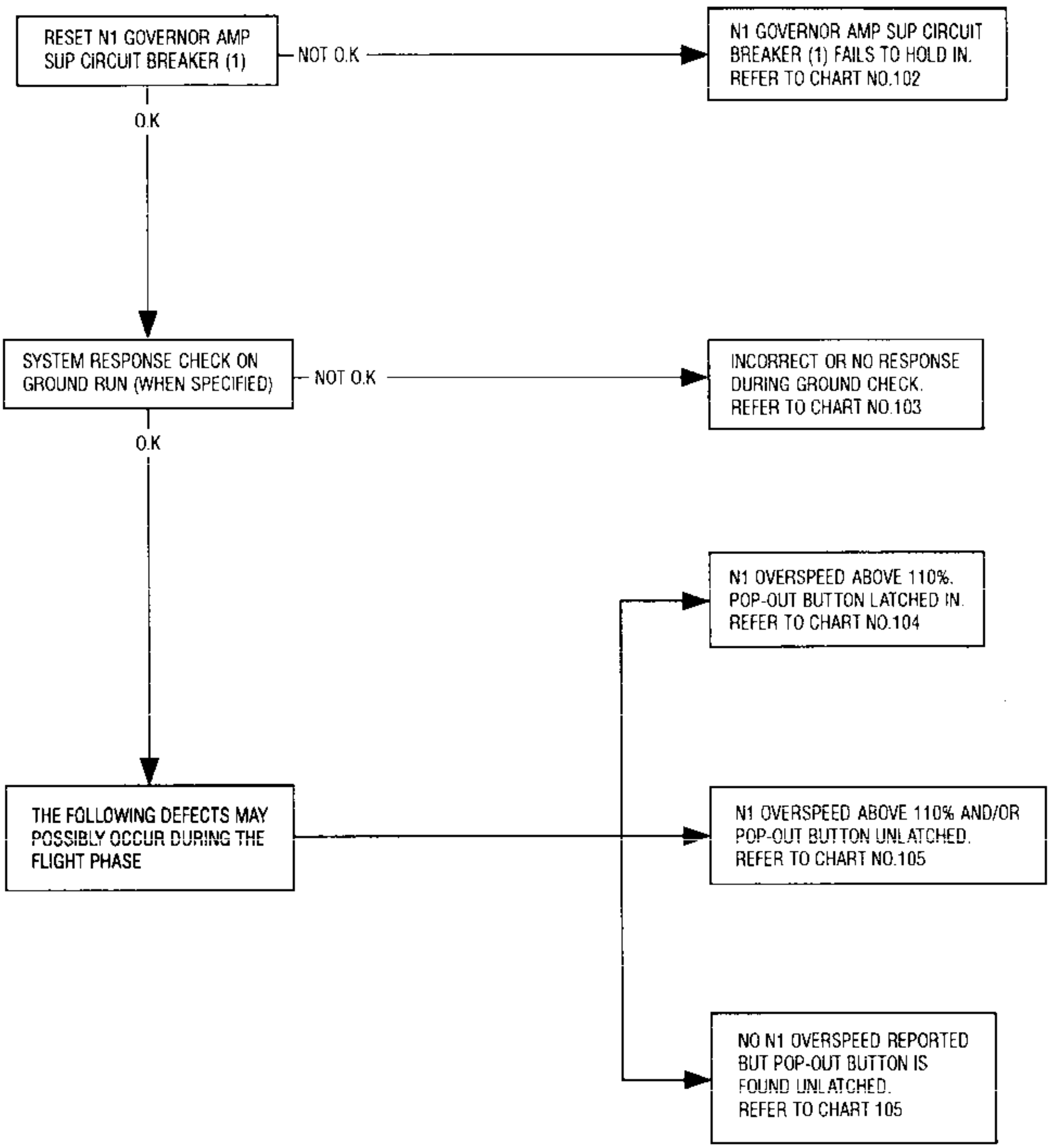
A. Ensure that external electrical power is connected and switched on.

B. Consult chart 101 and carry out the actions indicated to determine which of the trouble shooting charts is applicable.

3. Restore to Flight Standard

A. Complete and check any necessary rectification.

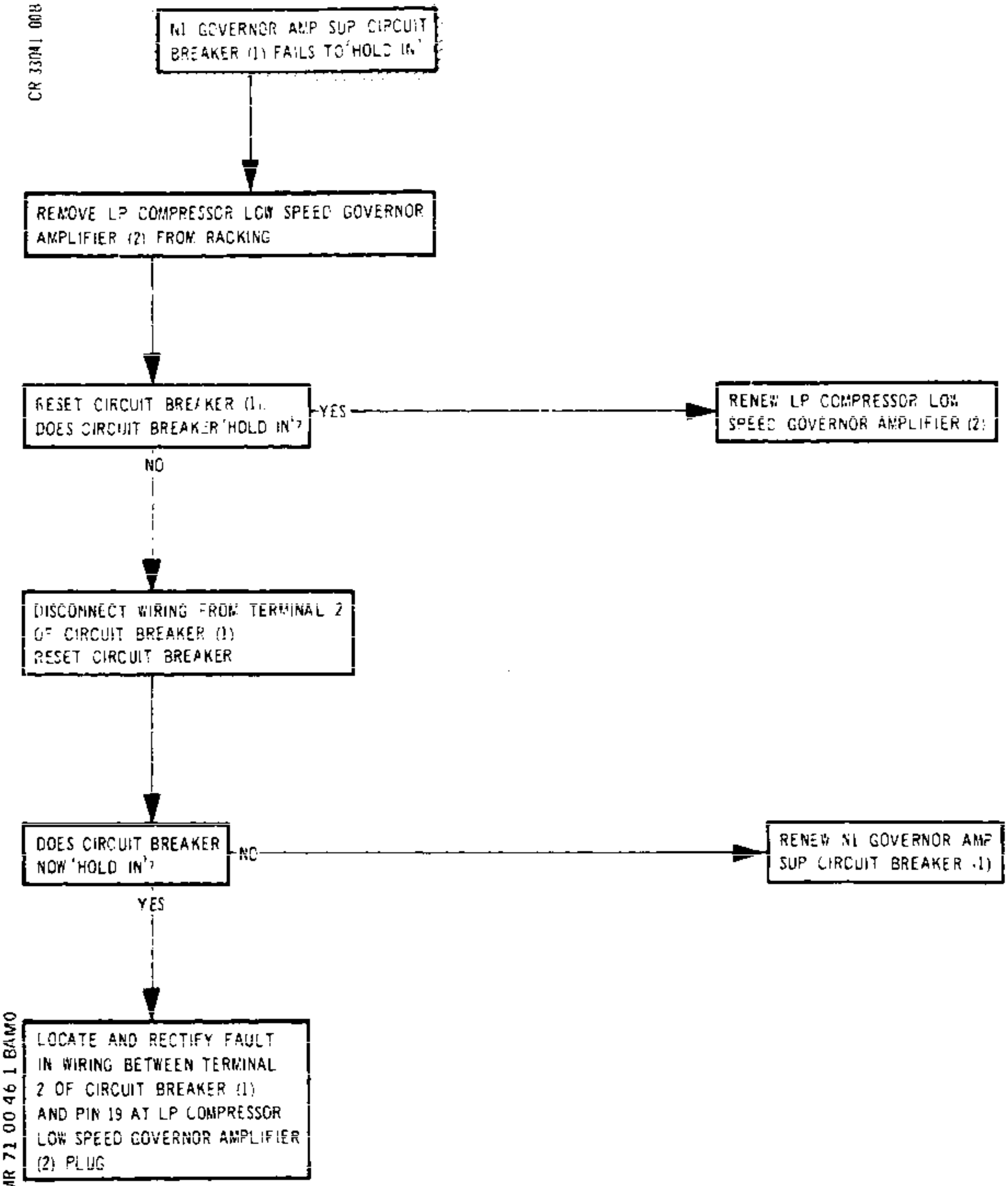
B. Reconnect all points where disconnection has been made during checking and rectification procedures.



CR 33040/00C

Chart 101

CR 33041 008



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R

Chart 102

CR 33042/000
BS0001.6617/2

NOTE:
BUTTON COULD HAVE UNLATCHED IF LPC SOLENOID OR LP COMPRESSOR SPEED PROBE CIRCUITS WERE INTERRUPTED BY DISTURBANCE OF CONNECTOR WHILE CIRCUIT BREAKER (1) IS SET AND GROUND POWER IS ON. THIS COULD OCCUR DURING ENGINE CHANGE OR REMOVAL OF CONNECTORS WHEN INVESTIGATING A DIFFERENT DEFECT. IF BUTTON IS UNLATCHED SYSTEM IS INOPERATIVE.

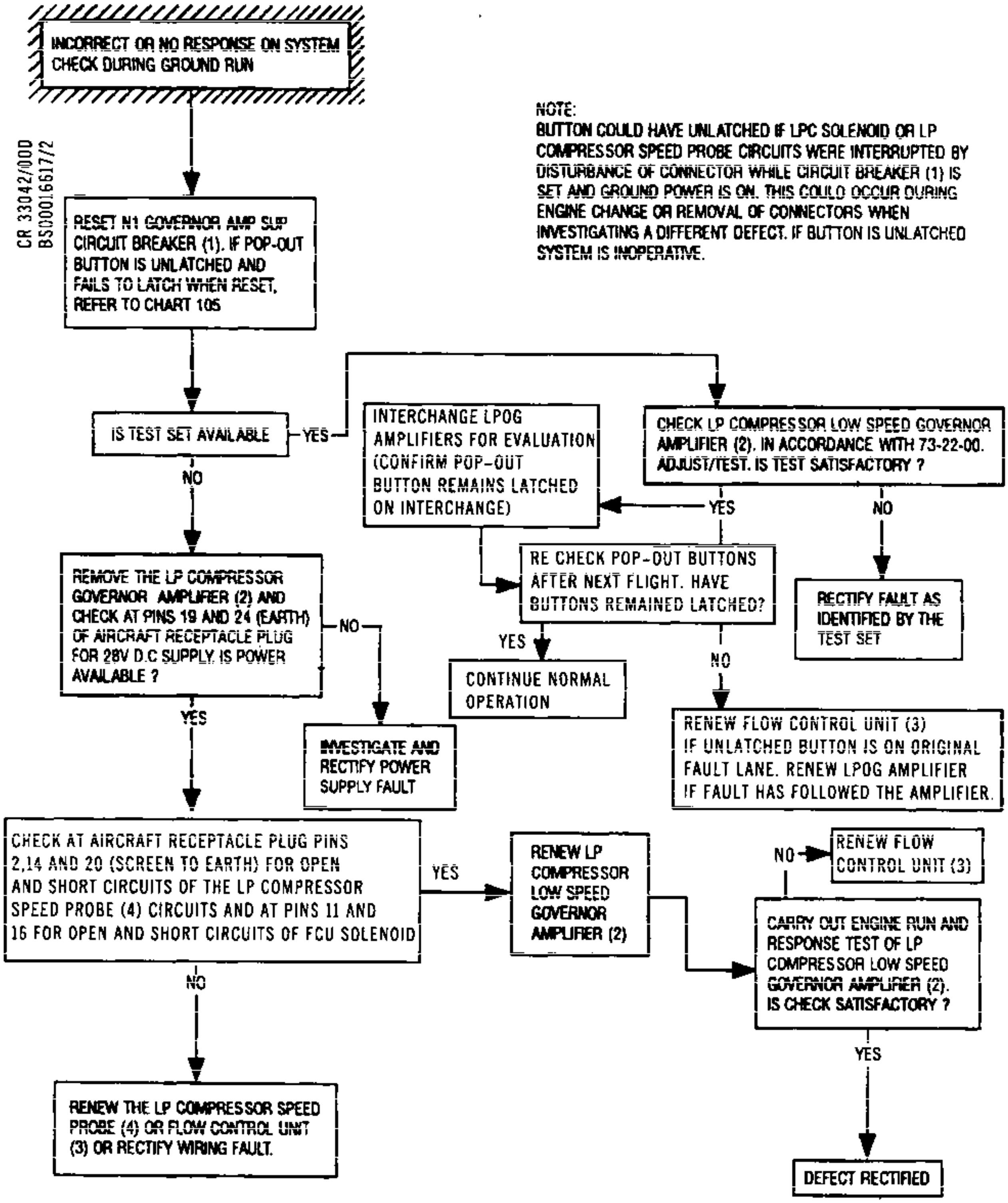


Chart 103

NOTE :
DEGREE OF OVERSPEED INDICATES THAT:
(1) THERE IS AN ENGINE CONTROL SYSTEM DEFECT. REFER TO CONTROL SYSTEM TROUBLE SHOOTING
(2) THERE IS AN LP COMPRESSOR OVERSPEED CONTROL SYSTEM DEFECT. REFER TO GENERAL PARAGRAPH 1

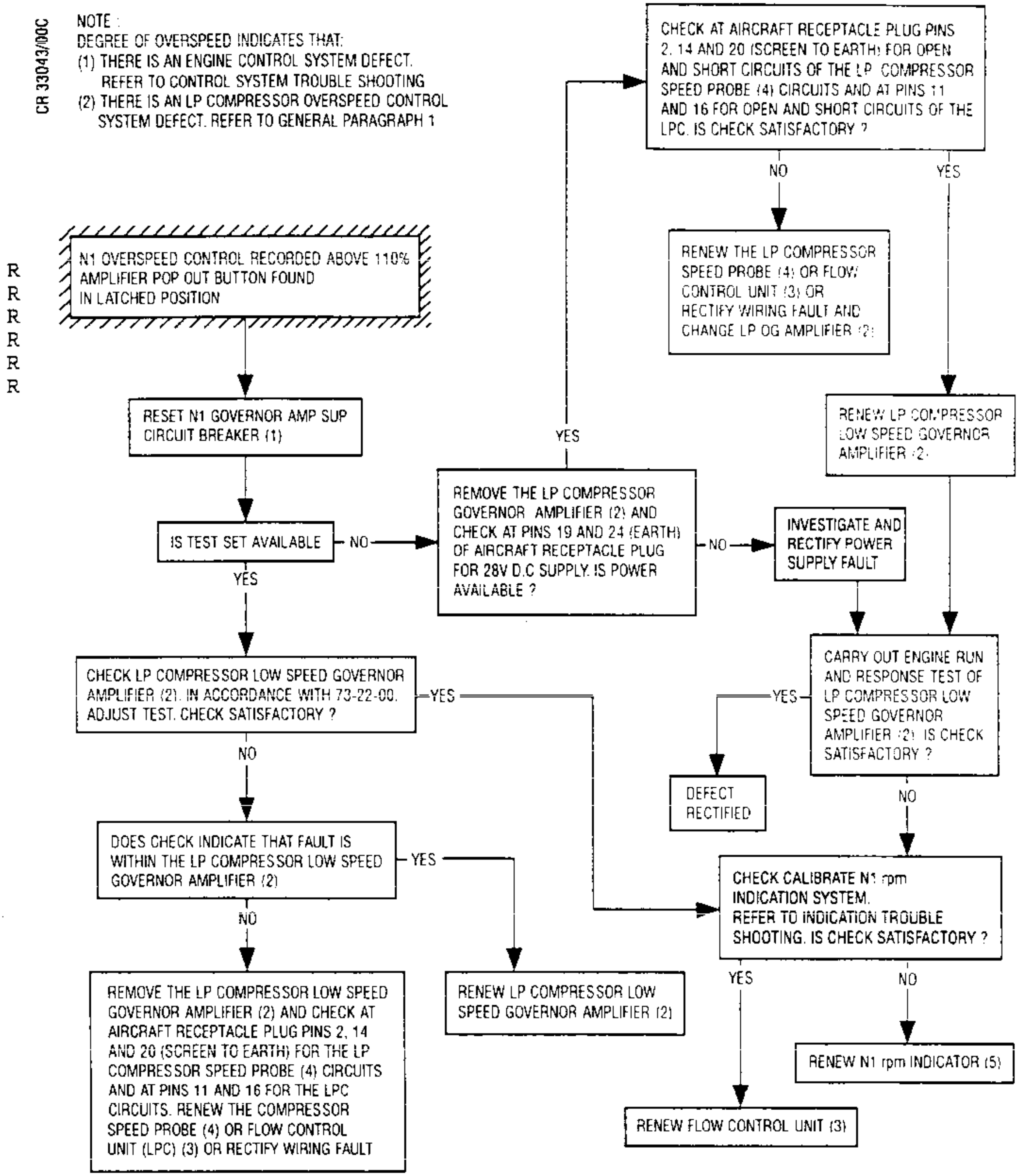


Chart 104

CR 33044/00C

NOTE :
DEGREE OF OVERSPEED INDICATES THAT:
(1) THERE IS AN ENGINE CONTROL SYSTEM DEFECT. (REFER TO CONTROL SYSTEM TROUBLE SHOOTING)
(2) THERE IS AN LP COMPRESSOR OVERSPEED CONTROL SYSTEM DEFECT. (REFER TO GENERAL PARAGRAPH 1)

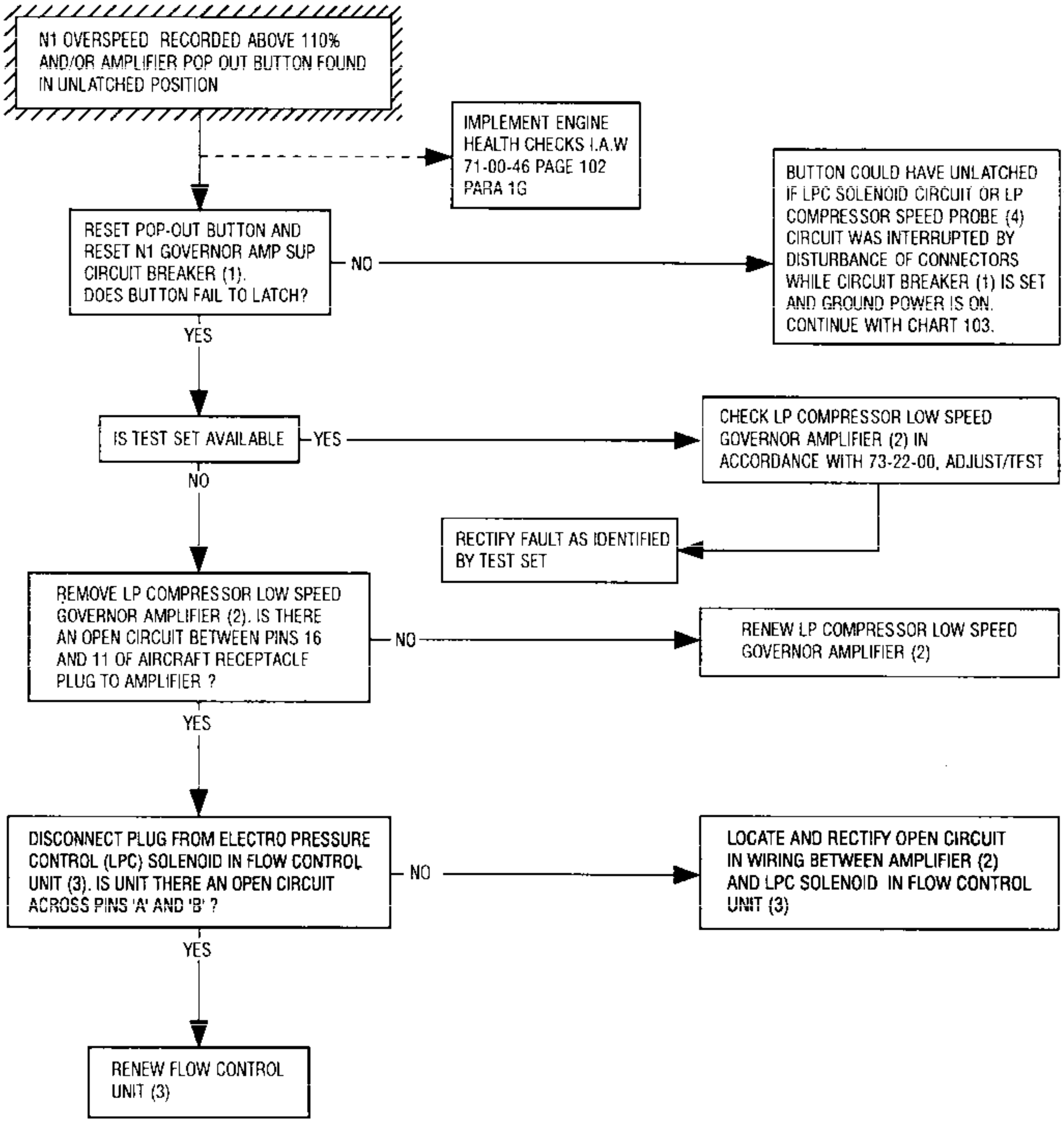


Chart 105

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
ENGINE NO.1						
(1) Circuit breaker 28 V	-	1-213	1K161	Map.Ref.C1		
(2) LP compressor low speed governor amplifier	-	2-215	1K162	-	73-22-11	
(3) Flow control unit	-	415	-	-	73-21-01	
(4) LP compressor speed probe unit	-	416	-	-	73-22-01	
(5) N1 rpm indicator	-	6-211	1E152	-	77-11-00	
ENGINE NO.2						
(1) Circuit breaker 28 V	-	3-213	2K161	Map.Ref.D3		
(2) LP compressor low speed governor amplifier	-	1-215	2K162	-	73-22-11	
(3) Flow control unit	-	425	-	-	73-21-01	
(4) LP compressor speed probe unit	-	426	-	-	73-22-01	
(5) N1 rpm indicator	-	6-211	2E152	-	77-11-00	
ENGINE NO.3						
(1) Circuit breaker 28 V	-	3-213	3K161	Map.Ref.D4		

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(2) LP compressor low speed governor amplifier	-	1-216	3K162	-	73-22-11	
(3) Flow control unit	-	435	-	-	73-21-01	
(4) LP compressor speed probe unit	-	436	-	-	73-22-01	
(5) N1 rpm indicator	-	6-211	3E152	-	77-11-00	
ENGINE NO.4						
(1) Circuit breaker 28 V	-	1-213	4K161	Map.Ref.C2		
(2) LP compressor low speed governor amplifier	-	2-216	4K162	-	73-22-11	
(3) Flow control unit	-	445	-	-	73-21-01	
(4) LP compressor speed probe unit	-	446	-	-	73-22-01	
(5) N1 rpm indicator	-	6-211	4E152	-	77-11-00	

CComponent Identification
Table 101

ENGINE POWER CONTROL - TROUBLE SHOOTING

1. General

A. The engine control system description and operation is given in detail in 76-10-00. The system comprises two identical control lanes controlled by either a MAIN or ALTERNATE engine control amplifier as activated by an illuminated lock toggle throttle master switch on the pilot's roof panel. The switch has three positions, MAIN, OFF and ALTERN (alternate). If a failure of the selected lane is detected, engine control is automatically switched to the other lane and the throttle master switch illuminates. The failure is confirmed by the illumination of a red caption behind the appropriate throttle lever, together with a red throttle master caption and audio warning. The warnings will cancel when the throttle master switch is selected to the current operative lane, but will remain 'on' in the event of a double lane failure.

Engine control schedule selection (relationship between the HP and LP spool speeds) is by means of two switches, a schedule switch and a programme slector switch situated at the third crew members station.

The three positions of the schedule switch are LO, AUTO and HI. The LO selection is an override selection and gives the low schedule under all conditions. The AUTO selection is the normal selection for flight and arms the programme selector switch which is used for all schedule selections. The HI selection is also an override selection and gives the high schedule during dry operation or the mid schedule during reheat operation. The HI selection also gives the low schedule if the under-carriage is extended, or during reheat operation with either the CTY(contingency) or TAKE-OFF ratings selected

The programme selector switch positions are FLYOVER, NORMAL and APPROACH. FLYOVER selects a noise abatement schedule provided that aircraft speed is greater than 220 knots and reheat is 'off'. NORMAL is selected for normal flight. When the aircraft speed is less than 220 knots, and NORMAL is selected the LO scheoule is in operation. When the aircraft speeo is greater than 220 knots, selecting NORMAL gives HI during 'dry' operation, or MID during reheat operation with the engine rating mode switch selected to flight and LO during reheat operation with TAKE-OFF selected. APPROACH is selected for noise abatement and gives MID law with the aircraft in flight and makes an automatic selection of LO at touch-down (detected by the undercarriage weight switch). Also, LO is automatically selected during reheat operation with TAKE-OFF selected.

A 16 light indication matrix with the captions F/O, HI, MID and LO for each engine is situated at the third crew members station.

Within the engine control amplifier, the EGT, N1 and N2 signals are compared with datums which are a function of engine intake total air temperature T1, free stream total air pressure (P infinity) ano ambient air temperature (t alpha) signals representing different scheduled operating conditions of the engine. Should any datum be reached, fuel flow will be controlled to engsure that the datum is not exceeded, irrespective of pilot demand. The datums in the engine control amplifier are established by the setting of the ENG RATING MODE switch and the ENG FLIGHT RATING switch on the pilot's roof panel. The engine rating mode switch has two positions, TAKE-OFF and FLIGHT and is spring-loaded to TAKE-OFF. FLIGHT cannot be set until the undercarriage is locked up. On completion of noise abatement procedures after take-off, the switch is selected to FLIGHT, thus arming the ENG FLIGHT RATING switch which is set to CLIMB. At a predetermined condition of flight the switch is selected to CRUISE. Therefore, with the throttle lever set to MAX, the engine control amplifier controls the fuel flow and primary nozzle area to give the required power settings.

The four engine rating mode switches and the four flight rating switches are ganged to facilitate simultaneous selection.

An indicator on the left of the pilot's centre panel indicates CTY/TO/CLB/CRS for the four engines and the appropriate caption illuminates if any one engine is selected to that rating.

Situated on the third crew members panel, are the caption lights and test switch for the nozzle angle scheduling unit (NASU). The operating position of the switch is NORM and if either the NASU should fail or the air data computer (ADC) signal to it fails, the yellow NOZZLE caption will illuminate. The caption illuminates when the test switch is selected to positions 1 and 2.

B. A test set is provided to test the engine electrical control system in situ by connecting the test set cables to test sockets on the engine control amplifier (Ref.76-00-00, Adjustment/ Test). The test set incorporates its own self-checking system.

A simple test (Ref.76-10-00, Adjustment/Test) is provided to enable continuity checking and fault location of all sub-units of the control system external to the amplifier. Type A6A16/24CC and A6A16/24DC engine control amplifiers incorporate a fault identification module (FIM) that, when made effective by S.B.OL.593-768726-45, will be activated when some faults occur and enable the defective component to be directly identified. The detailed test procedure to use when FIM is available is given in 76-11-00, Adjustment/Test, paragraph 8.

C. Trouble shooting charts give the sequential checks in respect of specific symptons. Refer to Table 101 to establish the chart applicable to the symptons stated.

A list of circuits and the related wiring diagrams in respect of each engine is given in Table 102. This table is used in conjunction with Tables 103 and 104, which give the checks that can be made at an engine control amplifier rack connector. Figure 101 shows the amplifier rack connector plug pin locations which are identified with specific checks in the tables. Engine control schedule circuit diagrams and component locations are shown in Figures 101, 102 and 103.

Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is detailed in Table 105.

2. Preparation

WARNING: COMPLY WITH ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

A. Ensure that external electrical power is connected and switched on.

B. Refer to Table 101 and determine the trouble shooting chart applicable to the defect symptons encountered.

DEFECT	CHART NO.
Throttle fail and MWS captions illuminated. Captions cancel when THROTTLE MASTER switch is selected to the other lane.	101
Engine Control Schedule Lights - indicate LO on one engine when the other engines indicat F/O.	102
Engine Control Schedule Lights - indicate LO on one engine when the other engines indicate HI.	103
Engine Control Schedule Lights - indicate LO on one engine when the other engines indicate MID. ENGINE CONTROL SHCEDULE selectors set at AUTO and NORMAL.	104
Engine Control Schedule Lights = LO illuminated for two symmetrical engines with HI illuminated for the other two.	105
Engine Control Schedule Lights - LO illuminated for two symmetrical engines with F/O illuminated for other two.	106
Engine Control Schedule Lights - LO illuminated for two symmetrical engines with MID illuminated for the other two.	107

List of Trouble Shooting Charts
Table 101 (Continued)

DEFECT	CHART NO.
Engine Control Schedule Lights - indicate LO on two symmetrical engines with all THROTTLE MASTER switches at the same setting and ENGINE CONTROL SCHEDULE selector set at HI landing gear retracted. The possible combinations of defect indication are releated to one or other of two checking sequences. Select sequence applicable to symptom.	108
Engine Control Schedule Lights - indicate MID on one engine when the other engines indicate HI, ENGINE CONTROL SCHEDULE selectors set at AUTO and NORMAL, ENG RATING MODE selectors set at FLIGHT and R/H (reheat) selectors set at OFF. Confirm that reheat circuit breakers are reset.	109
Engine ignition - defect disclosed by Adjustment/Test procedure of 76-11-00.	110
ENG RATING MODE selector does not latch in FLIGHT position.	111
ENG RATING MODE selector remains in the FLIGHT position when landing gear is locked DOWN.	112
High N_2 or EGT indicated in relation to other engines, both MAIN and ALTERN engine control amplifiers affected. ENG RATING MODE selector remains latched in the FLIGHT position. ENG FLIGHT RATING selector set at CLIMB or CRUISE.	113
Throttle failure warnings illuminated with THROTTLE MASTER switch set at OFF and HP valve switch set at SHUT..	114
RATING IND SUP circuit breaker K2300(10) trips when ENG RATING MODE selectors are set to FLIGHT with ENG FLIGHT RATING selectors set at CRUISE.	115

List of Trouble Shooting Charts
Table 101 (Continued)

DEFECT	CHART NO.
Engine Control Schedule supply 1 circuit breaker K24(2) tripped and fails to reset ENGINE CONTROL SCHEDULE selectors set at AUTO and NORMAL.	116
Engine Control Schedule supply 2 circuit breaker K35(1) tripped and fails to reset. ENGINE CONTROL SCHEDULE selectors set at AUTO and NORMAL.	117
Rating indicator supply circuit breaker K2300(10) trips when CTY(contingency) is selected.	118
Rating indicator supply circuit breaker K2300(10) tripped and will not reset. ENG RATING MODE selector set at FLIGHT and ENG FLIGHT RATING selector set at CLIMB.	119
Either the MAIN or the alternative throttle supply circuit breaker K1(11) and K2(12) tripped and will not reset.	120
K3 circuit breaker tripped - fault associated with THROTTLE MASTER switch setting, OFF, MAIN or ALTERN.	121
K4 circuit breaker tripped - fault associated with THROTTLE MASTER switch setting, OFF, MAIN or ALTERN.	122
Loss of all throttle failure indications - disclosed during maintenance checks of the engine control amplifier safety using the test set and procedure of 76-11-00, Adjustment/Test.	123
Rating indicator supply circuit breaker K2300(10) tripped and will not test. Ref. wiring diagram 76-11-55.	124
Alternative throttle failure indication and reverse schedule supply circuit breaker (9) tripped and will not reset.	125

List of Trouble Shooting Charts
Table 101 (Continued)

DEFECT	CHART NO.
Throttle failure circuit breakers K5(8) and K6(9) trip when HP VALVE switch is set to OPEN with THROTTLE MASTER switch set at OFF.	126

List of Trouble Shooting Charts
Table 101 (Concluded)

3. <u>Trouble shooting using engine control amplifiers with active fault identification modules (FIM)</u>

<u>NOTE:</u> This procedure should be followed at any station where fault identification test sets are not available.

A. Establish whether reported engine power control defect is associated with both the Main and Alternate engine control amplifiers.

If the defect is associated with both amplifiers, trouble shooting MUST be carried out in accordance with the relevant chart as shown in Table 101.

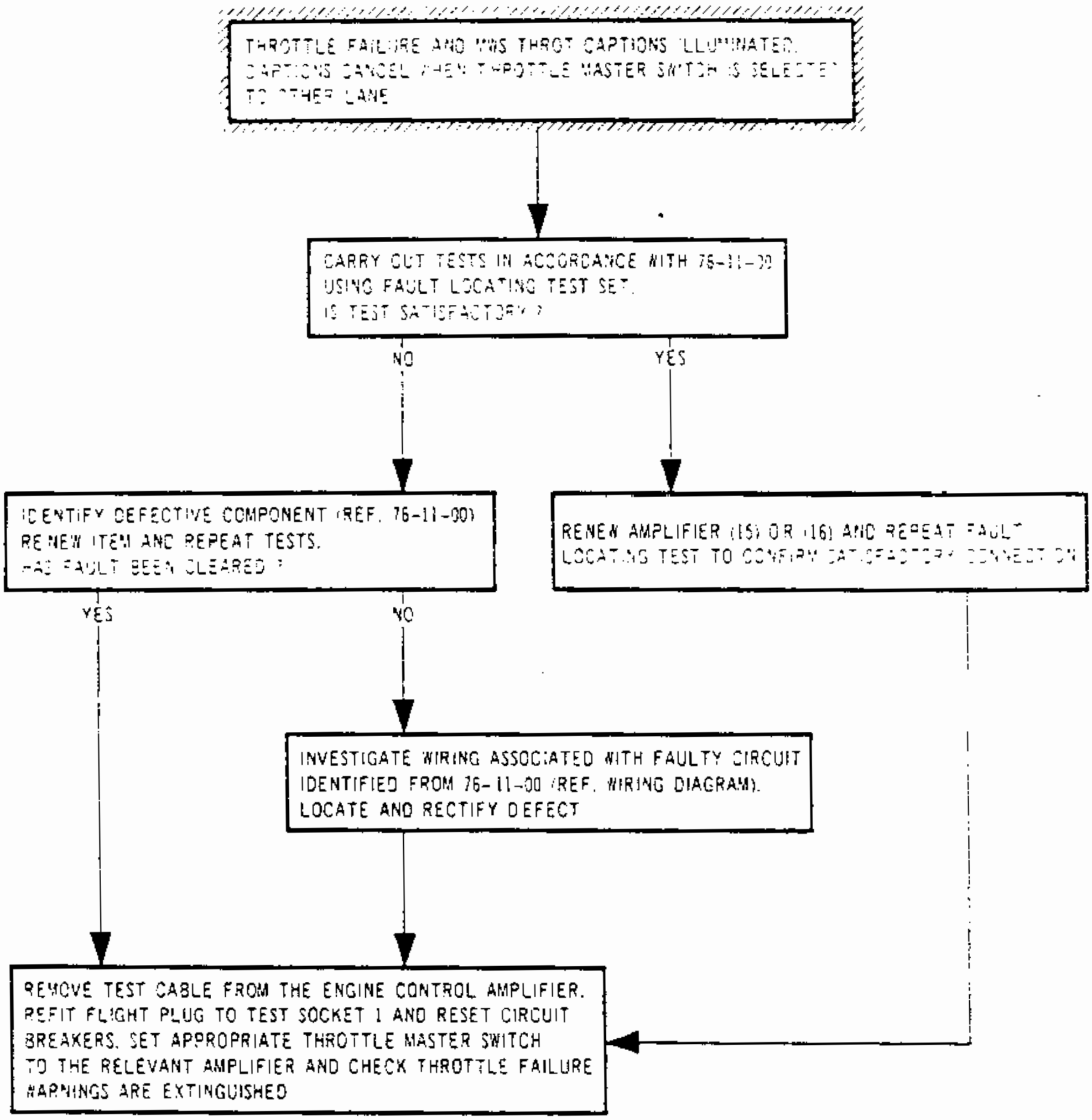
If the defect is associated with only one of the engine control amplifiers, trouble shooting may be carried out using the following procedure.

B. If the amplifier associated with the defect does not feature a Fault Identification Module, interchange with an amplifier that does have a FIM facility. Record the change in the Technical Log.

C. With a FIM equipped amplifier in the defective lane, carry out FIM procedure as defined in 76-11-00 page 594 paragraph 13. Ensure that the procedure is carried out fully to allow for the possibility of there being multiple defects within the control lane.

D. If it was necessary to interchange amplifiers to get a FIM module on the troublesome control lane and the procedure in 76-11-00 fails to reveal any defects, the original amplifier should be considered as suspect and changed.

E. Rectify all defects as necessary.



REF. WIRING DIAGRAM –
ENGINE 1 76-11-11, 76-13-11 AND 76-13-12
ENGINE 2 76-11-21, 76-13-21 AND 75-13-22
ENGINE 3 76-11-31, 76-13-31 AND 76-13-32
ENGINE 4 76-11-41 76-13-41 AND 76-13-42

Chart 101

R B 4. Restore to Flight Standard

A. Complete and check any necessary rectification.

B. Reconnect all points where disconnection has been made during checking and rectification procedures.

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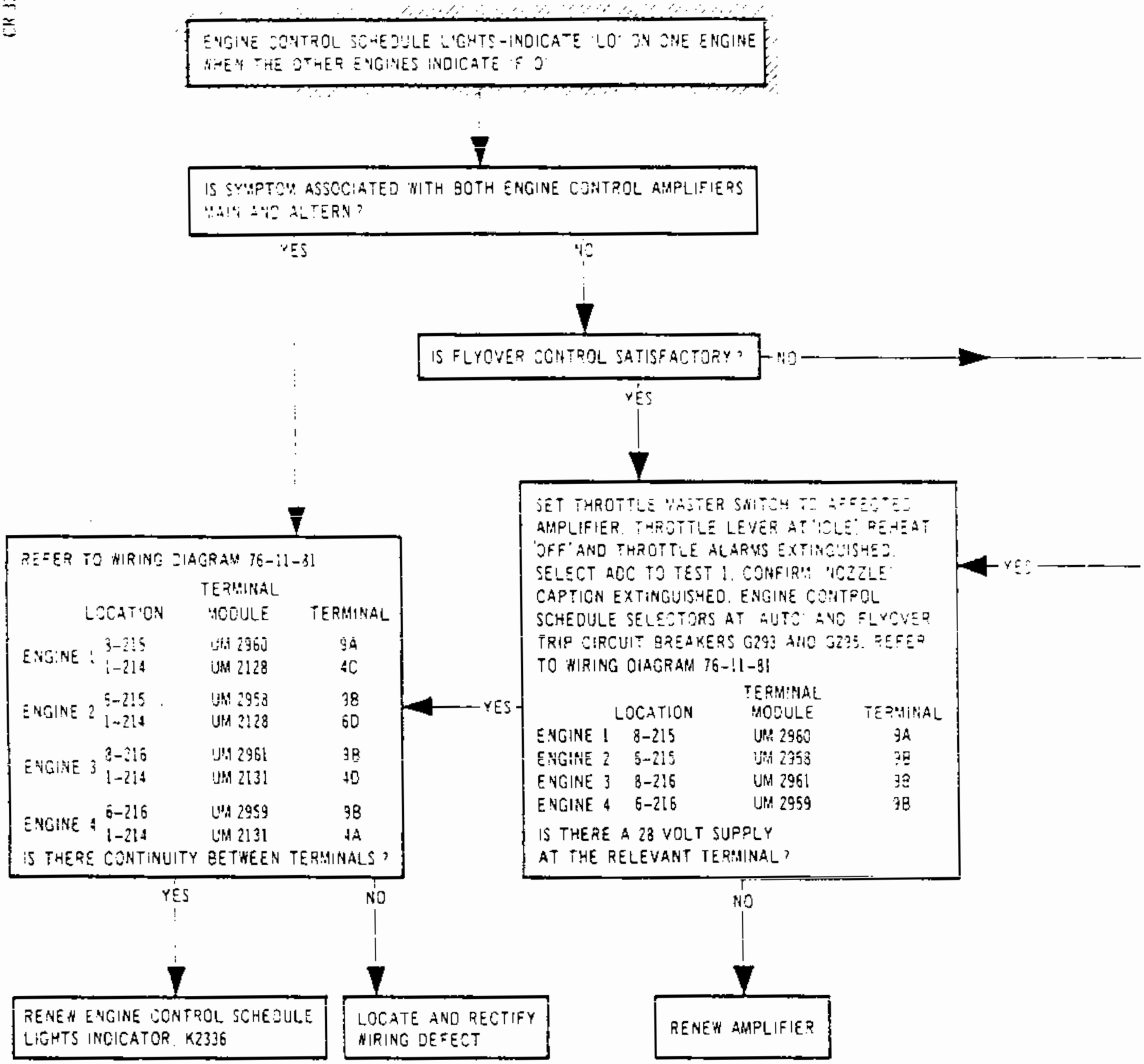

Chart 102 (Sheet 1 of 2)

NO → CONNECT TEST CABLE 1 FROM TEST SET PL1 TO AFFECTED AMPLIFIER TEST SK1. SET CIRCUIT BREAKERS G292 AND G294. SELECT ACC TO TEST 1. CONFIRM 'NOZZLE' CAPTION EXTINGUISHED. ENGINE CONTROL SCHEDULE SELECTORS TO 'AUTO' AND 'FLYOVER'. THROTTLE MASTER SWITCH 'OFF', LEVER AT 'IDLE' AND REHEAT 'OFF'. TRIP CIRCUIT BREAKERS G293 AND G295. DOES TEST LAMP 'EH' ILLUMINATE ?

YES ←

NO ↓

TRANSFER TEST CABLE TO THE OTHER AMPLIFEIR TEST SK1. DOES TEST SET LAMP 'EH' ILLUMINATE ?

YES ↓

REFER TO WIRING DIAGRAM 76-10-12 76-10-22 76-10-32 AND 76-10-42. LOCATE AND RECTIFY DEFECT

NO ↓

RENEW NASU

Chart 102 (Sheet 2 of 2)

ENGINE CONTROL SCHEDULE LIGHTS INDICATE 'LO' ON ONE ENGINE WHEN THE OTHER ENGINES INDICATE 'HI'.

REFER TO WIRING DIAGRAMS 76-11-71, 76-11-72 AND 76-11-81
IS SYMPTOM ASSOCIATED WITH BOTH ENGINE CONTROL AMPLIFIERS 'MAIN' AND 'ALTERN' WITH ENGINE CONTROL SCHEDULE SELECTORS SET AT 'AUTO' AND 'NORMAL' ?

YES

CHECK WIRING BETWEEN AMPLIFIERS AND CONTROL SCHEDULE LIGHTS INDICATOR
REFER TO WIRING DIAGRAM 76-11-81

	LOCATION	TERMINAL MODULE	TERMINAL
ENGINE 1	3-215	UM 2960	10G
	1-214	UM 2128	4B
ENGINE 2	6-215	UM 2958	10G
	1-214	UM 2128	4G
ENGINE 3	3-216	UM 2961	9C
	1-214	UM 2131	4G
ENGINE 4	6-216	UM 2959	9C
	1-214	UM 2131	4B

CHECK FOR CONTINUITY BETWEEN THE RELEVANT TERMINAL BLOCKS. IS CHECK SATISFACTORY ?

YES: RENEW CONTROL SCHEDULE LIGHTS INDICATOR

NO: LOCATE AND RECTIFY WIRING DEFECT

NO

WITH TEST SET CABLE 2 CONNECTED INTO TEST SOCKET [illegible] OF THE AFFECTED AMPLIFIER, SET THROTTLE MASTER SWITCH TO THE ASSOCIATED AMPLIFIER AND CONFIRM NO FAILURE WARNING. TRIP CIRCUIT BREAKERS [illegible] AND [illegible] AND SET K34 AND K35. ENGINE CONTROL SCHEDULE SELECTOR SET TO 'HI', PROGRAMME SELECTOR SET TO 'NORMAL'.
IS AMBER 'EN' LIGHT ON THE TEST SET ILLUMINATED ?

NO: REFER TO CHART 105

YES

GAIN ACCESS TO THE ASSOCIATED TERMINAL MODULE.
REFER TO WIRING DIAGRAM 76-11-81

	CONTROL	LOCATION	TERMINAL MODULE	TERMINAL
ENGINE 1	MAIN	3-215	UM 2960	10C
	ALTERN	3-215	UM 2960	9G
ENGINE 2	MAIN	6-215	UM 2958	10C
	ALTERN	6-215	UM 2958	9G
ENGINE 3	MAIN	3-216	UM 2961	9G
	ALTERN	3-216	UM 2961	10C
ENGINE 4	MAIN	6-216	UM 2959	9G
	ALTERN	6-216	UM 2959	10C

CHECK AT TERMINAL FOR 28 VOLT SUPPLY. RENEW ENGINE CONTROL AMPLIFIER IF SUPPLY NOT AVALIABLE

Chart 103

ENGINE CONTROL SCHEDULE LIGHTS-INDICATE 'LO' ON ONE ENGINE WHEN THE OTHER ENGINES INDICATE 'MID'

IS SYMPTOM ASSOCIATED WITH BOTH ENGINE CONTROL AMPLIFIERS 'MAIN' AND 'ALTERN' WITH ENGINE CONTROL SCHEDULE SELECTORS SET AT 'AUTO' AND 'NORMAL'?

NO: SET THROTTLE MASTER SWITCH TO AFFECTED AMPLIFIER AND CHECK THROTTLE FAILURE WARNINGS EXTINGUISHED. TRIP CIRCUIT BREAKERS G293 AND G295. SET REHEAT SELECTORS TO 'OFF' AND RESET REHEAT CIRCUIT BREAKERS. ENGINE CONTROL SCHEDULE SELECTORS SET TO 'NORMAL' AND 'HI'. RELEVANT ENGINE CONTROL SCHEDULE LIGHT 'HI' ILLUMINATED. APPROPRIATE RATING MODE SELECTOR SET TO 'FLIGHT'. ASSOCIATED HP VALVE SELECTOR SET TO 'OPEN' AND REHEAT SELECTOR SET TO 'REHEAT'. CHECK CONTROL SCHEDULE LIGHT 'MID' ILLUMINATED AND 'HI' EXTINGUISHED. IF CHECK IS UNSATISFACTORY RENEW ENGINE CONTROL AMPLIFIER

YES: ON AFFECTED ENGINE SET THROTTLE MASTER SWITCH OFF AND HP VALVE SWITCH OPEN. DO THROTTLE FAILURE WARNINGS OPERATE SATISFACTORY?

NO: REFER TO WIRING DIAGRAM, LOCATE AND RECTIFY DEFECT

YES: CHECK WIRING BETWEEN THE AMPLIFIERS AND THE CONTROL SCHEDULE LIGHTS INDICATOR. REFER TO WIRING DIAGRAM 76-11-81. IS CHECK SATISFACTORY?

NO: LOCATE AND RECTIFY WIRING DEFECT

YES: RENEW ENGINE CONTROL SCHEDULE LIGHTS INDICATOR

REF. WIRING DIAGRAM -

ENGINE 1	76-10-11
ENGINE 2	76-10-21
ENGINE 3	76-10-31
ENGINE 4	76-10-41

Chart 104

ENGINE CONTROL SCHEDULE LIGHTS - 'LO' ILLUMINATED FOR TWO SYMMETRICAL ENGINES WITH 'HI' ILLUMINATED FOR THE OTHER TWO. ENGINE CONTROL SCHEDULE SELECTORS SET AT 'AUTO' AND 'NORMAL'

IF NO.1 AND NO.4 LIGHTS 'LO' ILLUMINATED WITH THROTTLE MASTER SWITCHES NO.1 AND NO 4 SET AT MAIN, OR NO.2 AND NO.3 LIGHTS 'LO' ILLUMINATED WITH THROTTLE MASTER SWITCHES NO.2 AND NO.3 SET AT 'ALTERN', THEN DEFECT SYMPTOM IS ASSOCIATED WITH NASU 1. WAS 'NOZZLE' FAIL CAPTION ILLUMINATED ?

YES

RENEW NASU 1

NO

CIRCUIT BREAKER K34 SET. THROTTLE MASTER SWITCHES SET AS ABOVE. CHECK THROTTLE FAILURE WARNING NOT ACTIVATED. TRIP CIRCUIT BREAKERS G293 AND G295. REHEAT SELECTORS SET TO 'OFF' CIRCUIT BREAKERS K1541 AND K1542 SET. SET ENGINE CONTROL SCHEDULE SELECTOR TO 'HI'. DO ENGINE CONTROL SCHEDULE LIGHTS 'HI' ILLUMINATE ?

NO

REFER TO WIRING DIAGRAM 76-11-71. CIRCUIT BREAKER K34 RESET. ENGINE CONTROL SCHEDULE SELECTOR SET TO 'AUTO'. CHECK 28 VOLT SUPPLY IS AVAILABLE AT THE TEST CONNECTOR J17 SOCKET A ON THE FRONT FACE OF THE ASSOCIATED NASU 1. NEGATIVE RETURN VIA TEST CONNECTOR J17 SOCKET A. IF NOT SATISFACTORY LOCATE AND RECTIFY WIRING DEFECT, OR RENEW ENGINE CONTROL SCHEDULE SELECTOR IF FOUND DEFECTIVE.

YES

REMOVE NASU 1 FROM RACKING. CHECK WIRING FOR CONTINUITY BETWEEN RACKING CONNECTOR K1123, B17 AND TERMINAL MODULE UM 2967 TERMINAL 1D. ALSO BETWEEN B18 AND TERMINAL MODULE UM 2960 TERMINAL 7A. IS CHECK SATISFACTORY ?

YES

RENEW NASU 1

NO

LOCATE AND RECTIFY WIRING DEFECT

Chart 105 (Sheet 1 of 2)

IF NO.2 AND NO.3 LIGHTS 'LO' ILLUMINATED WITH THROTTLE MASTER SWITCHES NO.2 AND NO.3 SET AT 'MAIN', OR NO.1 AND NO.4 LIGHTS 'LO' ILLUMINATED WITH THROTTLE MASTER SWITCHES NO.1 AND NO.4 SET AT 'ALTERN', THEN DEFECT SYMPTOM IS ASSOCIATED WITH NASU 2. WAS 'NOZZLE' FAIL CAPTION ILLUMINATED ?

CR 33287 00B

NO

YES

RENEW NASU 2

CIRCUIT BREAKER K35 SET. THROTTLE MASTER SWITCHES SET AS ABOVE. CHECK THROTTLE FAILURE WARNING NOT ACTIVATED. TRIP CIRCUIT BREAKERS G293 AND G295 REHEAT SELECTORS SET TO OFF. CIRCUIT BREAKERS K1541 AND K1542 SET. SET ENGINE CONTROL SCHEDULE SELECTOR TO 'HI'. DO ENGINE CONTROL SCHEDULE LIGHTS 'HI' ILLUMINATE ?

YES

NO

REFER TO WIRING DIAGRAM 76-11-72. CIRCUIT BREAKER K35 RESET. ENGINE CONTROL SCHEDULE SELECTOR SET TO 'AUTO'. CHECK 28 VOLT SUPPLY IS AVAILABLE AT THE TEST CONNECTOR J17 SOCKET A ON THE FRONT FACE OF THE ASSOCIATED NASU 2. NEGATIVE RETURN VIA TEST CONNECTOR J17 SOCKET A. IF NOT SATISFACTORY LOCATE AND RECTIFY WIRING DEFECT, OR RENEW ENGINE CONTROL SCHEDULE SELECTOR IF FOUND DEFECTIVE.

REMOVE NASU 2 FROM RACKING. CHECK WIRING FOR CONTINUITY BETWEEN RACKING CONNECTOR K1124, B17 AND TERMINAL MODULE UM 2968 TERMINAL 1G, ALSO BETWEEN B18 AND TERMINAL MODULE UM 2961 TERMINAL 7D. IS CHECK SATISFACTORY ?

YES

NO

RENEW NASU 2

LOCATE AND RECTIFY WIRING DEFECT

Chart 105 (Sheet 2 of 2)

CR 33302/006

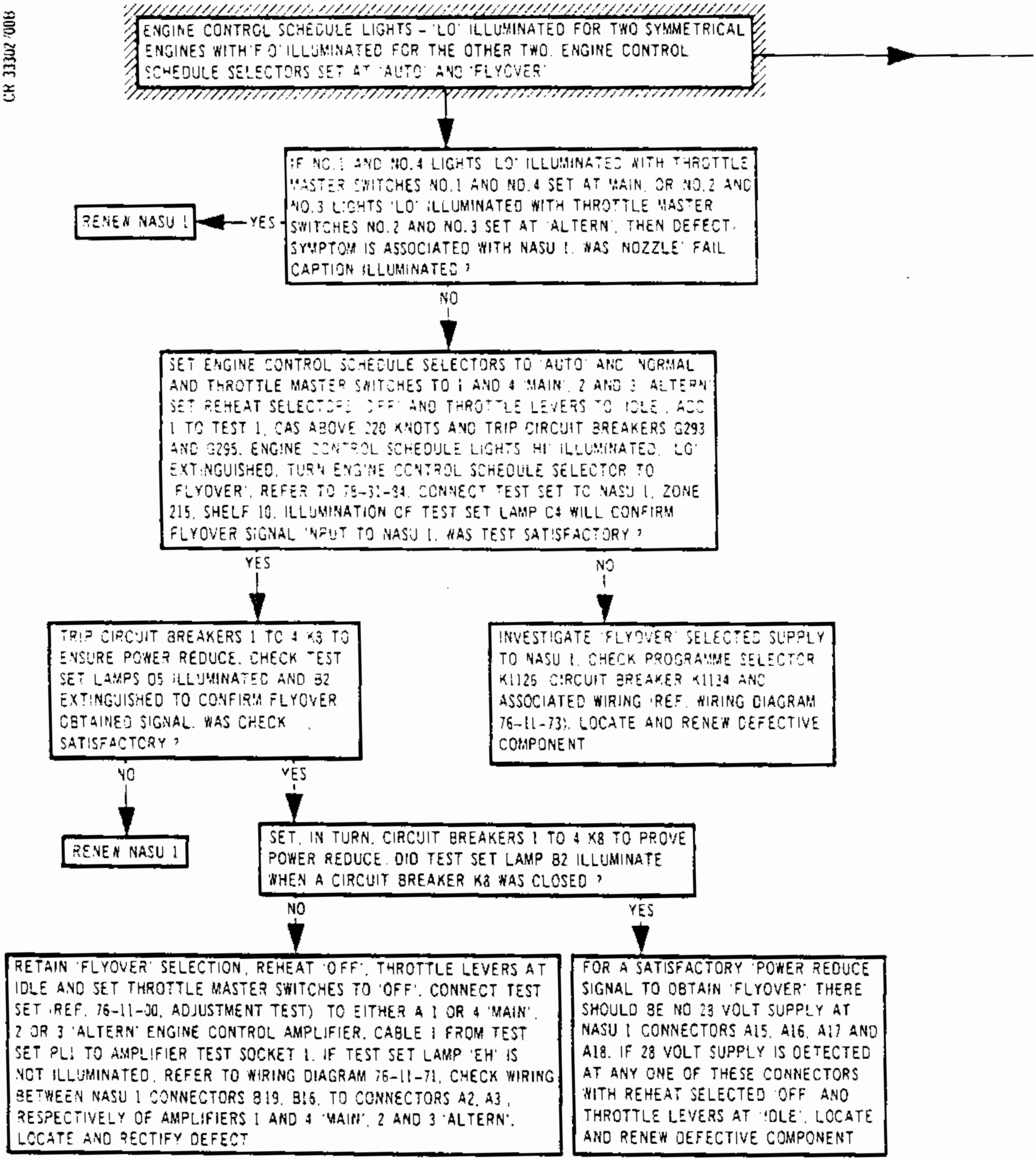

Chart 106 (Sheet 1 of 2)

IF NO.2 AND NO.3 LIGHTS 'LO' ILLUMINATED WITH THROTTLE MASTER SWITCHES NO.2 AND NO.3 SET AT 'MAIN' OR NO.1 AND NO.4 LIGHTS 'LO' ILLUMINATED WITH THROTTLE MASTER SWITCHES NO.1 AND NO.4 SET AT 'ALTERN', THEN DEFECT SYMPTOM IS ASSOCIATED WITH NASU 2. WAS 'NOZZLE' FAIL CAPTION ILLUMINATED ?

YES → RENEW NASU 2

NO ↓

SET ENGINE CONTROL SCHEDULE SELECTORS TO 'AUTO' AND 'NORMAL' AND THROTTLE MASTER SWITCHES TO 2 AND 3 'MAIN', 1 AND 4 'ALTERN'. SET REHEAT SELECTORS 'OFF' AND THROTTLE LEVERS TO 'IDLE'. ADC 2 TO TEST 1. CAS ABOVE 320 KNOTS AND TRIP CIRCUIT BREAKERS G293 AND G295. ENGINE CONTROL SCHEDULE LIGHTS 'HI' ILLUMINATED, 'LO' EXTINGUISHED. TURN ENGINE CONTROL SCHEDULE SELECTOR TO 'FLYOVER'. REFER TO 73-31-84. CONNECT TEST SET TO NASU 2, ZONE 216, SHELF 01. ILLUMINATION OF TEST SET LAMP C4 WILL CONFIRM FLYOVER SIGNAL INPUT TO NASU 2. WAS TEST SATISFACTORY ?

NO → INVESTIGATE 'FLYOVER' SELECTED SUPPLY TO NASU 2. CHECK PROGRAMME SELECTOR K1126, CIRCUIT BREAKER K1135 AND ASSOCIATED WIRING (REF. WIRING DIAGRAM 76-11-73). LOCATE AND RENEW DEFECTIVE COMPONENT.

YES ↓

TRIP CIRCUIT BREAKERS 1 TO 4 K8 TO ENSURE POWER REDUCE. CHECK TEST SET LAMPS D5 ILLUMINATED AND B2 EXTINGUISHED TO CONFIRM FLYOVER OBTAINED SIGNAL. WAS CHECK SATISFACTORY ?

NO → RENEW NASU 2

YES ↓

SET, IN TURN, CIRCUIT BREAKERS 1 TO 4 K8 TO PROVE POWER REDUCE. DID TEST SET LAMP B2 ILLUMINATE WHEN A CIRCUIT BREAKER K8 WAS CLOSED ?

YES → FOR A SATISFACTORY 'POWER REDUCE' SIGNAL TO OBTAIN 'FLYOVER' THERE SHOULD BE NO 28 VOLT SUPPLY AT NASU 2 CONNECTORS A15, A16, A17 AND A18. IF 28 VOLT SUPPLY IS DETECTED AT ANY ONE OF THESE CONNECTORS WITH REHEAT SELECTED 'OFF' AND THROTTLE LEVERS AT 'IDLE', LOCATE AND RENEW DEFECTIVE COMPONENT.

NO → RETAIN 'FLYOVER' SELECTION, REHEAT 'OFF', THROTTLE LEVERS AT IDLE AND SET THROTTLE MASTER SWITCHES TO 'OFF'. CONNECT TEST SET (REF. 76-11-00, ADJUSTMENT TEST) TO EITHER A 2 OR 3 'MAIN' 1 OR 4 'ALTERN' ENGINE CONTROL AMPLIFIER. CABLE 1 FROM TEST SET PL1 TO AMPLIFIER TEST SOCKET 1. IF TEST SET LAMP EH IS NOT ILLUMINATED, REFER TO WIRING DIAGRAM 76-11-72. CHECK WIRING BETWEEN NASU 2 CONNECTORS B19, B16, TO CONNECTORS A2, A3, RESPECTIVELY OF AMPLIFIERS 2 AND 3 'MAIN', 1 AND 4 'ALTERN'. LOCATE AND RECTIFY DEFECT.

REF. WIRING DIAGRAM :-

ENGINE 1	76-15-61
ENGINE 2	76-15-62
ENGINE 3	76-15-63
ENGINE 4	76-15-64

CR 33140 00B

Chart 106 (Sheet 2 of 2)

CR 33141 01B

ENGINE CONTROL SCHEDULE LIGHTS- 'LO' ILLUMINATED FOR TWO SYMMETRICAL ENGINES WITH 'MID' ILLUMINATED FOR THE OTHER TWO. ENGINE CONTROL SCHEDULE SELECTORS SET AT 'AUTO' AND 'APPROACH'. HP VALVE SWITCH SET AT OPEN AND WEIGHT SWITCH RELAYS DE-ENERGIZED (I.E. FLIGHT).

IF NO.1 AND NO.4 LIGHTS 'LO' ILLUMINATED WITH THROTTLE MASTER SWITCHES NO.1 AND NO.4 SET AT 'MAIN', OR NO.2 AND NO.3 LIGHTS 'LO' ILLUMINATED WITH THROTTLE MASTER SWITCHES NO.2 AND NO.3 SET AT 'ALTERN', THEN DEFECT SYMPTOM IS ASSOCIATED WITH NASU 1. WAS 'NOZZLE' FAIL CAPTION ILLUMINATED ?

YES

RENEW NASU 1

NO

DO ENGINE CONTROL SCHEDULE LIGHTS NO.1 AND NO.4 'MID' ILLUMINATE WHEN NO.1 AND NO.4 THROTTLE MASTER SWITCHES ARE SET TO 'ALTERN' ?

YES

NASU 1 CIRCUIT BREAKERS K34 AND K1134 SET. THROTTLE MASTER SWITCHES SET TO 1 AND 4 'MAIN', 2 AND 3 'ALTERN'. REHEAT SELECTORS 'OFF'. CIRCUIT BREAKERS 1 TO 4 K1541 AND 1 TO 4 K1542 SET. CIRCUIT BREAKER G293 TRIPPED. ENGINE CONTROL SCHEDULE SELECTORS SET TO 'AUTO' AND 'APPROACH'. ENGINE CONTROL SCHEDULE LIGHTS 'LO' ILLUMINATED. AUTO IGNITION SWITCHES OFF AND HP FUEL VALVE SWITCHES SET TO 'OPEN', ARE ALL 'MID' LIGHTS ILLUMINATED ?

NO

ENGINE CONTROL SCHEDULE LIGHTS INDICATOR SUSPECT. CHECK AND RENEW AS REQUIRED

YES

REFER TO WIRING DIAGRAM 32-61-06. CHECK WEIGHT AND SHORTENING LOCK SWITCHES FOR SATISFACTORY OPERATION. RECTIFY AS FOUND NECESSARY.

NO

RENEW NASU 1 AND REPEAT TEST. ARE ALL 'MID' LIGHTS ILLUMINATED ?

YES

FAULT CLEARED

NO

REFER TO WIRING DIAGRAM 76-11-71. CHECK FOR 28 VOLT SUPPLY FROM CIRCUIT BREAKER K1134 TO NASU 1 RACKING CONNECTORS A34 AND A37 AT NASU 1 TEST CONNECTOR J17 SOCKETS U AND M RESPECTIVELY. NEGATIVE RETURN VIA TEST CONNECTOR J17 SOCKET A. RENEW PROGRAMME SELECTOR K1126, RELAY G306, OR RECTIFY WIRING DEFECT AS FOUND NECESSARY.

Chart 107 (Sheet 1 of 2)

CR 33377 00B

IF NO.2 AND NO.3 LIGHTS 'LO' ILLUMINATED WITH THROTTLE MASTER SWITCHES NO.2 AND NO.3 SET AT 'MAIN' OR NO.1 AND NO.4 LIGHTS 'LO' ILLUMINATED WITH THROTTLE MASTER SWITCHES NO.1 AND NO.4 SET AT 'ALTERN', THEN DEFECT SYMPTOM IS ASSOCIATED WITH NASU 2. WAS 'NOZZLE' FAIL CAPTION ILLUMINATED ?

NO

YES

RENEW NASU 2

DO ENGINE CONTROL SCHEDULE LIGHTS NO.2 AND NO.3 'MID' ILLUMINATE WHEN NO.2 AND NO.3 THROTTLE MASTER SWITCHES ARE SET TO 'ALTERN' ?

YES

NO

ENGINE CONTROL SCHEDULE LIGHTS INDICATOR SUSPECT. CHECK AND RENEW AS REQUIRED

NASU 2 CIRCUIT BREAKERS K35 AND K1135 SET. THROTTLE MASTER SWITCHES SET TO 2 AND 3 'MAIN', 1 AND 4 'ALTERN'. REHEAT SELECTORS 'OFF'. CIRCUIT BREAKERS 1 TO 4 K1541 AND 1 TO 4 K1542 SET. CIRCUIT BREAKER G295 TRIPPED. ENGINE CONTROL SCHEDULE SELECTORS SET TO 'AUTO' AND 'APPROACH'. ENGINE CONTROL SCHEDULE LIGHTS 'LO' ILLUMINATED. AUTO IGNITION SWITCHES 'OFF' AND HP FUEL VALVE SWITCHES SET TO 'OPEN'. ARE ALL 'MID' LIGHTS ILLUMINATED ?

NO

YES

REFER TO WIRING DIAGRAM 32-61-06. CHECK WEIGHT AND SHORTENING LOCK SWITCHES FOR SATISFACTORY OPERATION. RECTIFY AS FOUND NECESSARY

RENEW NASU 2 AND REPEAT TEST. ARE ALL 'MID' LIGHTS ILLUMINATED ?

YES

FAULT CLEARED

NO

REFER TO WIRING DIAGRAM 76-11-72. CHECK FOR 28 VOLT SUPPLY FROM CIRCUIT BREAKER K1135 TO NASU 2 RACKING CONNECTORS A34 AND A37 AT NASU 2 TEST CONNECTOR J17 SOCKETS U AND M RESPECTIVELY. NEGATIVE RETURN VIA TEST CONNECTOR J17 SOCKET A. RENEW PROGRAMME SELECTOR K1126, RELAY G315, OR RECTIFY WIRING DEFECT AS FOUND NECESSARY.

Chart 107 (Sheet 2 of 2)

CR 33147 00B

ENGINE CONTROL SCHEDULE LIGHTS INDICATE 'LO' ON TWO SYMMETRICAL ENGINES WITH ALL THROTTLE MASTER SWITCHES AT THE SAME SETTING AND ENGINE CONTROL SCHEDULE SELECTOR SET AT 'HI'. LANDING GEAR RETRACTED. THE POSSIBLE COMBINATIONS OF DEFECT INDICATION ARE RELATED TO ONE OR OTHER OF TWO CHECKING SEQUENCES. SELECT SEQUENCE APPLICABLE TO SYMPTOM.

OBSERVED SYMPTOM -

CAPTION	-	1	2	3	4
MAIN AMPLIFIER	-	LO	HI	HI	LO
ALTERN AMPLIFIER	-	HI	LO	LO	HI

OBSERVED SYMPTOM -

CAPTION	-	1	2	3	4
MAIN AMPLIFIER	-	HI	LO	LO	HI
ALTERN AMPLIFIER	-	LO	HI	HI	LO

CONNECT TEST SET CABLE 2 BETWEEN TEST SET SOCKET 2 AND TEST SOCKET 2 OF ENGINE CONTROL AMPLIFIER 1 MAIN OR 4 MAIN. THROTTLE MASTER SWITCH OFF. RESET CIRCUIT BREAKER K34. 1 AND 4 CONTROL SCHEDULE LIGHTS 'LO' ILLUMINATED. ENGINE CONTROL SCHEDULE SELECTOR SET TO 'HI'. TRIP CIRCUIT BREAKER G293. IF TEST SET LIGHT 'EN' DOES NOT ILLUMINATE, REMOVE TEST CABLE FROM AMPLIFIER. CONNECT A TEST METER TO SOCKET 39 OF AMPLIFIER TEST SOCKET 2 (1 MAIN OR 4 MAIN). IS THERE A 28 VOLT SUPPLY AVAILABLE ?

NO

REFER TO WIRING DIAGRAM 76-11-71. LOCATE AND RECTIFY WIRING DEFECT BETWEEN ENGINE CONTROL SCHEDULE SELECTOR TERMINAL 1 AND TERMINAL MODULE UM 2959 TERMINAL 7 IN ZONE 6-216. RENEW SELECTOR IF FOUND DEFECTIVE. REFER TO WIRING DIAGRAM 32-61-62 IF DEFECT TRACED TO LANDING GEAR DOWN LOCK RELAY G329

YES

CHECK FOR CONTINUITY BETWEEN 1 OR 4 MAIN AMPLIFIER TEST SOCKET 2, SOCKET 32 AND EARTH. REFER TO WIRING DIAGRAM 76-11-71. RENEW ENGINE CONTROL SCHEDULE SELECTOR OR RECTIFY WIRING WHICHEVER IS FOUND DEFECTIVE

Chart 108 (Sheet 1 of 2)

CR3306 D0H

CONNECT TEST SET CABLE 2 BETWEEN TEST SET SOCKET 2 AND TEST SOCKET 2 OF ENGINE CONTROL AMPLIFIER 2 MAIN OR 3 MAIN. THROTTLE MASTER SWITCH OFF. RESET CIRCUIT BREAKER K35. 2 AND 3 CONTROL SCHEDULE LIGHTS 'LO' ILLUMINATED. ENGINE CONTROL SCHEDULE SELECTOR SET TO 'HIGH'. TRIP CIRCUIT BREAKER G295. IF TEST SET LIGHT 'EN' DOES NOT ILLUMINATE RESET CIRCUIT BREAKER 3K8. DOES NUMBER 3 RATING MODE SELECTOR REMAIN IN 'FLIGHT' POSITION WHEN SELECTED

NO

INVESTIGATE LANDING GEAR DOWN LOCK RELAY G373 AND CIRCUIT. WIRING DIAGRAM 32-61-63

YES

REMOVE TEST CABLE FROM AMPLIFIER TEST SOCKET 2. CONNECT A TEST METER IN TO SOCKET 39 OF AMPLIFIER TEST SOCKET 2 (2 MAIN OR 3 MAIN). IS THERE A 28 VOLT SUPPLY AVAILABLE ?

NO

REFER TO WIRING DIAGRAM 76-11-72. LOCATE AND RECTIFY WIRING DEFECT BETWEEN ENGINE CONTROL SCHEDULE SELECTOR TERMINAL 4 AND TERMINAL MODULE UM 2968 TERMINAL 1 IN ZONE S-216. RENEW SELECTOR IF FOUND DEFECTIVE. REFER TO WIRING DIAGRAM 32-61-63 IF DEFECT TRACED TO LANDING GEAR DOWN LOCK RELAY G373

YES

CHECK FOR CONTINUITY BETWEEN 2 OR 3 MAIN AMPLIFIER TEST SOCKET 2, SOCKET 32 AND EARTH. REFER TO WIRING DIAGRAM 76-11-72. RENEW ENGINE CONTROL SCHEDULE SELECTOR OR RECTIFY WIRING, WHICHEVER IS FOUND DEFECTIVE.

Chart 108 (Sheet 2 of 2)

CR 3143 00P

ENGINE CONTROL SCHEDULE LIGHTS – INDICATE 'MID' ON ONE ENGINE WHEN THE OTHER ENGINES INDICATE 'HI'. ENGINE CONTROL SCHEDULE SELECTORS SET AT 'AUTO' AND 'NORMAL'. ENGINE RATING MODE SELECTORS SET AT 'FLIGHT' AND REHEAT SELECTORS SET AT 'OFF'. CONFIRM THAT REHEAT CIRCUIT BREAKERS WERE RESET.

WAS SYMPTOM REPEATED WHEN THE OTHER ENGINE CONTROL AMPLIFIER SELECTED ?

YES

CARRY OUT MANUAL 'HI' CHECK PROCEDURE. THROTTLE MASTER SWITCH SET TO AN AMPLIFIER OF THE AFFECTED ENGINE. ENGINE CONTROL SCHEDULE SELECTORS SET TO 'NORMAL' AND 'HI'. ENGINE CONTROL SCHEDULE LIGHTS 'LO' ILLUMINATED. REHEAT SELECTORS VERIFY 'OFF', REHEAT CIRCUIT BREAKERS RESET. CIRCUIT BREAKERS G293 AND G295 TRIPPED. RATING MODE SELECTORS SET TO 'FLIGHT'. CHECK ENGINE CONTROL SCHEDULE LIGHTS 'LO' EXTINGUISHED 'HI' ILLUMINATED AND REMAINS IN THIS STATE WHEN THE OTHER AMPLIFIER IS SELECTED. IS CHECK SATISFACTORY ?

YES

SYSTEM NORMAL. DEFECT NOT CONFIRMED

NO

USE TEST SET AND CHECK FOR 28 VOLT SUPPLY FROM THE REHEAT CONTROL AMPLIFIER TO THE ENGINE CONTROL AMPLIFIER OF THE AFFECTED ENGINE. CONNECT CABLE 1 BETWEEN THE TEST SET AND SOCKET 1 OF THE ENGINE CONTROL AMPLIFIER. CIRCUIT BREAKERS K1, K2, K3 AND K4 RESET. CONFIRM REHEAT SELECTORS 'OFF' AND REHEAT CIRCUIT BREAKERS RESET. SET REHEAT SELECTOR TO 'REHEAT'. CHECK 'R H' LIGHT ON THE TEST SET ILLUMINATES AND RETURN REHEAT SELECTOR TO 'OFF'. DOES 'R H' LIGHT EXTINGUISH ?

NO

RENEW REHEAT CONTROL AMPLIFIER. IF SYMPTOM PERSISTS AFTER AN AMPLIFIER RENEWAL, INVESTIGATE AIRCRAFT WIRING

YES

RENEW ENGINE CONTROL AMPLIFIER

REF. WIRING DIAGRAM –

ENGINE 1	76-15-81
ENGINE 2	76-15-82
ENGINE 3	76-15-83
ENGINE 4	76-15-84

Chart 109

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CR 33144 008

ENGINE IGNITION - DEFECT DISCLOSED BY ADJUSTMENT TEST PROCEDURE OF 75-11-00

IGNITION CAPTIONS DID NOT ILLUMINATE DURING FLAME OUT SYSTEM CHECK. PROCEED AS FOLLOWS -
AUTO IGNITION AND ENGINE START SWITCHES SET TO 'OFF'. THROTTLE MASTER SWITCH SET TO 'OFF'. CONNECT CABLE 1 FROM TEST SET PLUG 1 TO THE MAIN ENGINE CONTROL AMPLIFIER TEST SOCKET 1. RESET IGNITION CIRCUIT BREAKERS J1 AND J2 AND SET AUTO IGNITION SWITCH AT 'ON'.
DO TEST SET LAMPS A1 AND C1 ILLUMINATE ?

LAMP A1 (LH. IGNITION) CONFIRMS 28 VOLT SUPPLY FROM CIRCUIT BREAKER J2
LAMP C1 (RH. IGNITION) CONFIRMS 28 VOLT SUPPLY FROM CIRCUIT BREAKER J1

YES →

NO ↓

AUTO IGNITION SWITCH SET AT 'OFF'. TRANSFER TEST CABLE 1 TO THE ALTERN AMPLIFIER TEST SOCKET 1. SET AUTO IGNITION SWITCH AT 'ON'. DO TEST SET LAMPS A1 AND C1 ILLUMINATE ?

YES ↓ RENEW THE MAIN AMPLIFIER

NO ↓ REFER TO WIRING DIAGRAM LOCATE AND RECTIFY DEFECT

REF. WIRING DIAGRAMS -

	LH.IGN	RH.IGN
ENGINE 1	74-00-11	74-00-12
ENGINE 2	74-00-21	74-00-22
ENGINE 3	74-00-31	74-00-32
ENGINE 4	74-00-41	74-00-42

Chart 110 (Sheet 1 of 2)

YES →

CARRY OUT MANUAL RELIGHT TEST ON THE RELEVANT MAIN AMPLIFIER IN ACCORDANCE WITH 76-11-00 AND CONFIRM SATISFACTORY ILLUMINATION OF THE IGNITION CAPTIONS. IRRESPECTIVE OF WHICH ENGINES ARE BEING TESTED, IGNITION CIRCUIT BREAKERS 1J1 AND 4J1 MUST BE RESET FOR LH IGN. AND RH.IGN. CAPTIONS RESPECTIVELY

YES → RENEW THE MAIN AMPLIFIER

NO → TRANSFER TEST SET CONNECTIONS TO THE RELEVANT ALTERN AMPLIFIER AND REPEAT MANUAL RELIGHT TEST IS TEST SATISFACTORY ?

YES → RENEW THE ALTERN AMPLIFIER

NO → REFER TO THE WIRING DIAGRAM AND IDENTIFY THE REQUIRED TEST CONNECTION ON THE ASSOCIATED RELAY RACKING.

	LH.IGN.	RH.IGN	LOCATION
ENGINE 1	UT 1891-2A	UT 1891-2C	7-123
ENGINE 2	UT 1893-2A	UT 1893-2C	7-123
ENGINE 3	UT 1890-2A	UT 1890-2C	8-123
ENGINE 4	UT 1892-2A	UT 1892-2C	8-123

REPEAT IGNITION TEST, RELIGHT OR AUTO WHICHEVER IS CONVENIENT. DURING THE IGNITION TEST, CHECK FOR 28 VOLT SUPPLY AT TEST CONNECTION GIVEN. IS CHECK SATISFACTORY ?

YES → REFER TO 71-00-29, IGNITION TROUBLE SHOOTING

NO → CHECK WIRING BETWEEN CIRCUIT BREAKER J1, J2 THROUGH THE RELIGHT SELECTOR TO AMPLIFIER RACKING CONNECTORS A39 AND A42. LOCATE AND RECTIFY DEFECT.
NOTE -
TEST SET LAMPS A1 AND C1 CHECK ONLY THE AUTO IGNITION CIRCUIT

Chart 110 (Sheet 2 of 2)

CR 33145 00H

ENGINE RATING MODE SELECTOR DOES NOT LATCH IN THE 'FLIGHT' POSITION

RESET CIRCUIT BREAKERS 1 TO 4 K1542 ENGINE SHUT DOWN HANDLE NORMAL. REHEAT SWITCH SELECTED TO REHEAT. RESET CIRCUIT BREAKERS 1 TO 4 K8. DOES THE WHITE LIGHT ON THE NOZZLE AREA INDICATOR ILLUMINATE ?

NO: INVESTIGATE CIRCUIT BREAKERS 1 TO 4 K8 AND WIRING. LOCATE AND RECTIFY WIRING FAULT. RENEW CIRCUIT BREAKER IF FOUND DEFECTIVE

YES: RETURN REHEAT SWITCH TO 'OFF'. CARRY OUT A CHECK ON THE RATING MODE SWITCH FOR CONTINUITY BETWEEN TERMINAL MODULES IN THE ROOF PANEL ZONE 4-211

	TERMINAL MODULE	TERMINALS
ENGINE 1	UM 2013	16 AND 15
ENGINE 2	UM 2095	5 AND 6
ENGINE 3	UM 2077	20 AND 19
ENGINE 4	UM 2096	8 AND 9

MANUALLY HOLD RATING MODE SWITCH IN 'FLIGHT' POSITION IS THERE CONTINUITY BETWEEN TERMINAL MODULES ?

NO: RENEW RATING MODE SWITCH

YES: TRIP CIRCUIT BREAKERS G293 AND G295. CHECK FOR CONTINUITY TO EARTH FROM TERMINAL MODULES.

	TERMINAL MODULE	TERMINAL
ENGINE 1	UM 2013	15
ENGINE 2	UM 2095	6
ENGINE 3	UM 2077	19
ENGINE 4	UM 2096	9

LOCATE AND RECTIFY WIRING FAULT. IF DOWN LOCK RELAY SUSPECT, REFER TO -
ENGINES 1 AND 4 WIRING DIAGRAM 32-61-62
ENGINES 2 AND 3 WIRING DIAGRAM 32-61-63

REF. WIRING DIAGRAM -
ENGINE 1 76-11-51
ENGINE 2 76-11-52
ENGINE 3 76-11-53
ENGINE 4 76-11-54

Chart 111

ENGINE RATING MODE SELECTOR REMAINS IN THE 'FLIGHT' POSITION WHEN LANDING GEAR IS LOCKED DOWN.

CONFIRM RATING CONTROL CIRCUIT BREAKER K8 RESET
FOR RATING MODE SELECTORS 1 AND 4 TRIP CIRCUIT BREAKER G293
FOR RATING MODE SELECTORS 2 AND 3 TRIP CIRCUIT BREAKER G295

FLIGHT RATING SELECTORS SET TO 'CLIMB'. RATING MODE SELECTOR SET TO 'FLIGHT'. CHECK THAT IT IS LATCHED IN THE 'FLIGHT' POSITION. ENGINE RATING ANNUNCIATOR LIGHTS 'CLB' AND 'T O' ILLUMINATED. RESET CIRCUIT BREAKER G293 OR G295. CHECK RATING MODE SELECTOR AUTOMATICALLY RETURNS TO THE 'TAKE OFF' POSITION. 'CLB' LIGHT EXTINGUISHED.
IS CHECK SATISFACTORY ?

YES: SYSTEM NORMAL

NO: TRIP RATING CONTROL CIRCUIT BREAKER K8 AND CHECK ENGINE RATING MODE SELECTOR RETURNS TO THE 'TAKE OFF' POSITION. IS CHECK SATISFACTORY ?

YES: INVESTIGATE LANDING GEAR DOWN LOCK RELAY CIRCUIT.

	LOCATION
ENGINE 1	G329, 2-213
ENGINE 2	G328, 2-213
ENGINE 3	G372, 3-213
ENGINE 4	G373, 3-213

THESE RELAYS ARE ENERGISED WHEN THE LANDING GEAR IS LOCKED DOWN. THE CONTACTS CHANGE OVER AND CANCEL THE EARTH RETURN FOR THE RATING MODE SELECTOR MAGNETIC HOLD COIL

NO: RENEW RATING MODE SELECTOR K18

REF. WIRING DIAGRAMS
RELAYS -
ENGINE 1 - 76-11-51 } 32-61-62
ENGINE 2 - 76-11-54 }
ENGINE 3 - 76-11-52 } 32-61-63
ENGINE 4 - 76-11-53 }
GENERAL - 76-11-05 76-11-06

Chart 112

CR 33147 00R

HIGH 'N2' OR 'EGT' INDICATED IN RELATION TO OTHER ENGINES. BOTH MAIN AND ALTERN ENGINE CONTROL AMPLIFIERS AFFECTED. ENGINE RATING MODE SELECTOR REMAINS LATCHED IN THE 'FLIGHT' POSITION. ENGINE FLIGHT RATING SELECTOR SET AT 'CLIMB' OR 'CRUISE'.

↓

ENGINE CONTROL SCHEDULE LIGHTS 'LO' ILLUMINATED. ENGINE CONTROL SCHEDULE SELECTORS SET AT 'NORMAL' AND 'AUTO'. TRIP CIRCUIT BREAKERS G293 AND G295. REHEAT SELECTORS 'OFF'. REHEAT CIRCUIT BREAKERS 1 TO 4 K1542 SET. THROTTLE MASTER SWITCH SET AT 'MAIN'. NO FAILURE WARNING. ENGINE CONTROL SCHEDULE SELECTOR SET AT 'HI'. ENGINE CONTROL SCHEDULE LIGHTS 'HI' ILLUMINATED 'LO' EXTINGUISHED. ENSURE 'AUTO IGNITION' SELECTORS SET TO 'OFF'. RELEVANT HP VALVE SELECTOR SET TO 'OPEN'. RELEVANT REHEAT SELECTOR SET TO 'REHEAT'. ENGINE CONTROL SCHEDULE LIGHTS 'LO' ILLUMINATED, 'HI' EXTINGUISHED

↓

RELEVANT RATING MODE SELECTOR SET AT 'FLIGHT' AND LATCHED. RELEVANT FLIGHT RATING SELECTOR UNIT IN TURN TO 'CLIMB' THEN 'CRUISE'. ENGINE CONTROL SCHEDULE LIGHTS 'MID' ILLUMINATED AND 'LO' EXTINGUISHED FOR SATISFACTORY OPERATION. DOES 'LO' REMAIN ILLUMINATED WHEN 'CLIMB' OR 'CRUISE' SELECTED ? — NO →

YES ↓

INVESTIGATE WIRING IN ZONE 211 CHECK BETWEEN THE TERMINAL (GIVEN IN LIST BELOW) OF TERMINAL MODULE UM 2095 AND TERMINAL 5 OF THE ASSOCIATED RATING SWITCH K33. LOCATE AND RECTIFY DEFECT.

	TERMINAL
ENGINE 1	10A
ENGINE 2	14A
ENGINE 3	15A
ENGINE 4	16A

Chart 113 (Sheet 1 of 2)

REF TERMINAL MODULE IDENT -

	TERMINAL MODULE	LOCATION
ENGINE 1	UM 2954	6-215
ENGINE 2	UM 2952	6-215
ENGINE 3	UM 2955	8-216
ENGINE 4	UM 2953	6-216

REF WIRING DIAGRAM -

ENGINE 1	76-11-51
ENGINE 2	76-11-52
ENGINE 3	76-11-53
ENGINE 4	76-11-54

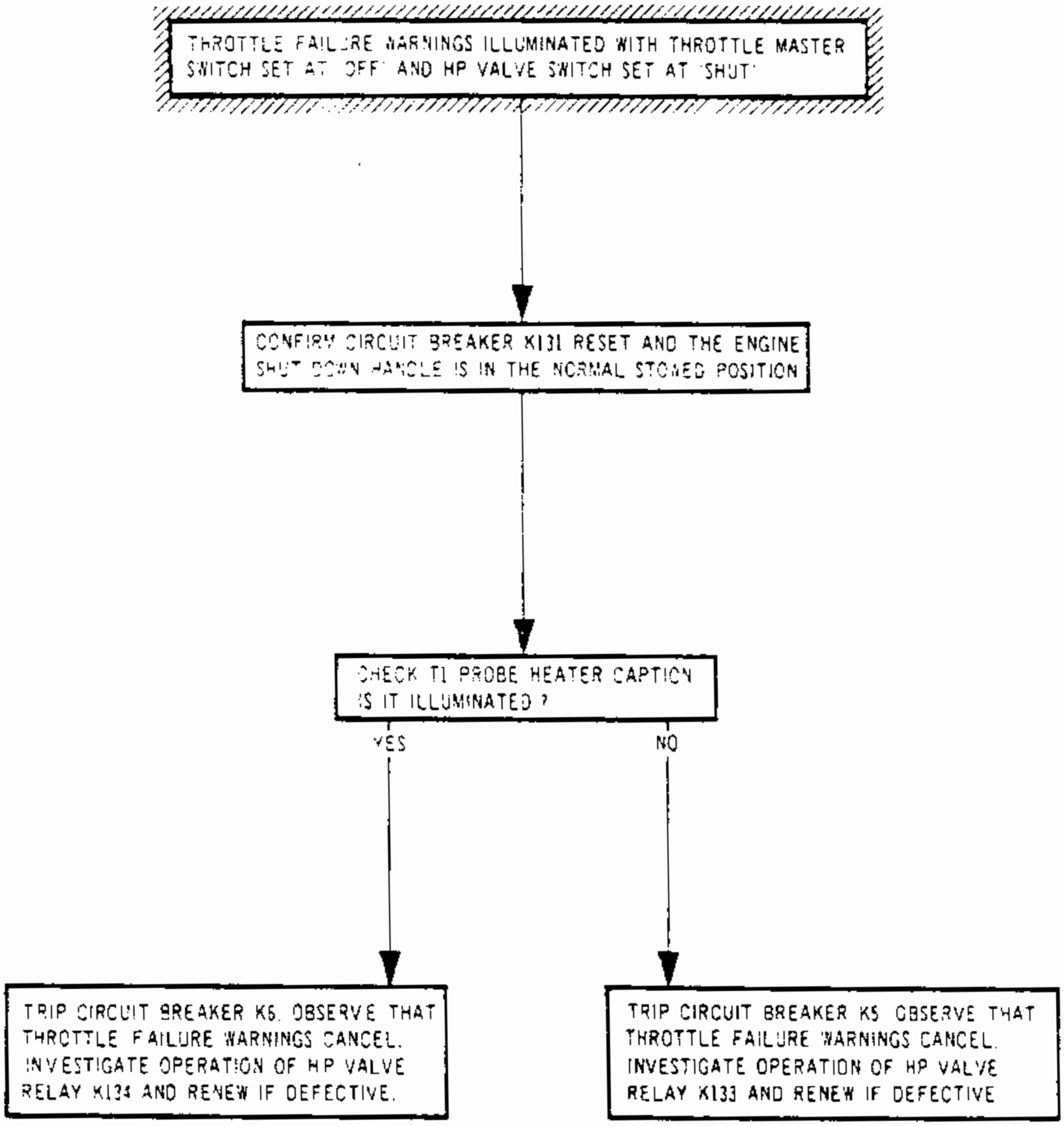
NO → DOES 'LO' REMAIN ILLUMINATED WHEN 'CLIMB' SELECTED ?

YES → GAIN ACCESS TO THE AFFECTED TERMINAL MODULE (SEE LIST) RETAIN 'FLIGHT' AND 'CLIMB' SELECTION AND CHECK FOR 28 VOLT SUPPLY AT TERMINAL 19B OF THE AFFECTED MODULE. IF NO SUPPLY, CHECK ASSOCIATED ENGINE RATING MODE SELECTOR K33 IN ZONE 211 AND WIRING BETWEEN SELECTOR TERMINAL 4 AND THE TERMINAL MODULE (REF WIRING DIAGRAM). RENEW RATING SELECTOR K33 IF FOUND DEFECTIVE, OR LOCATE AND RECTIFY WIRING DEFECT.

NO → 'LO' REMAINS ILLUMINATED WHEN 'CRUISE' SELECTED. GAIN ACCESS TO THE AFFECTED TERMINAL MODULE (SEE LIST). CHECK FOR 28 VOLT SUPPLY AT TERMINAL 19C OF THE AFFECTED MODULE. IF NO SUPPLY, CHECK ASSOCIATED RATING SELECTOR K33 IN ZONE 211 AND WIRING BETWEEN SELECTOR TERMINAL 6 AND THE TERMINAL MODULE (REF WIRING DIAGRAM). RENEW RATING SELECTOR K33 IF FOUND DEFECTIVE, OR LOCATE AND RECTIFY WIRING DEFECT.

Chart 113 (Sheet 2 of 2)

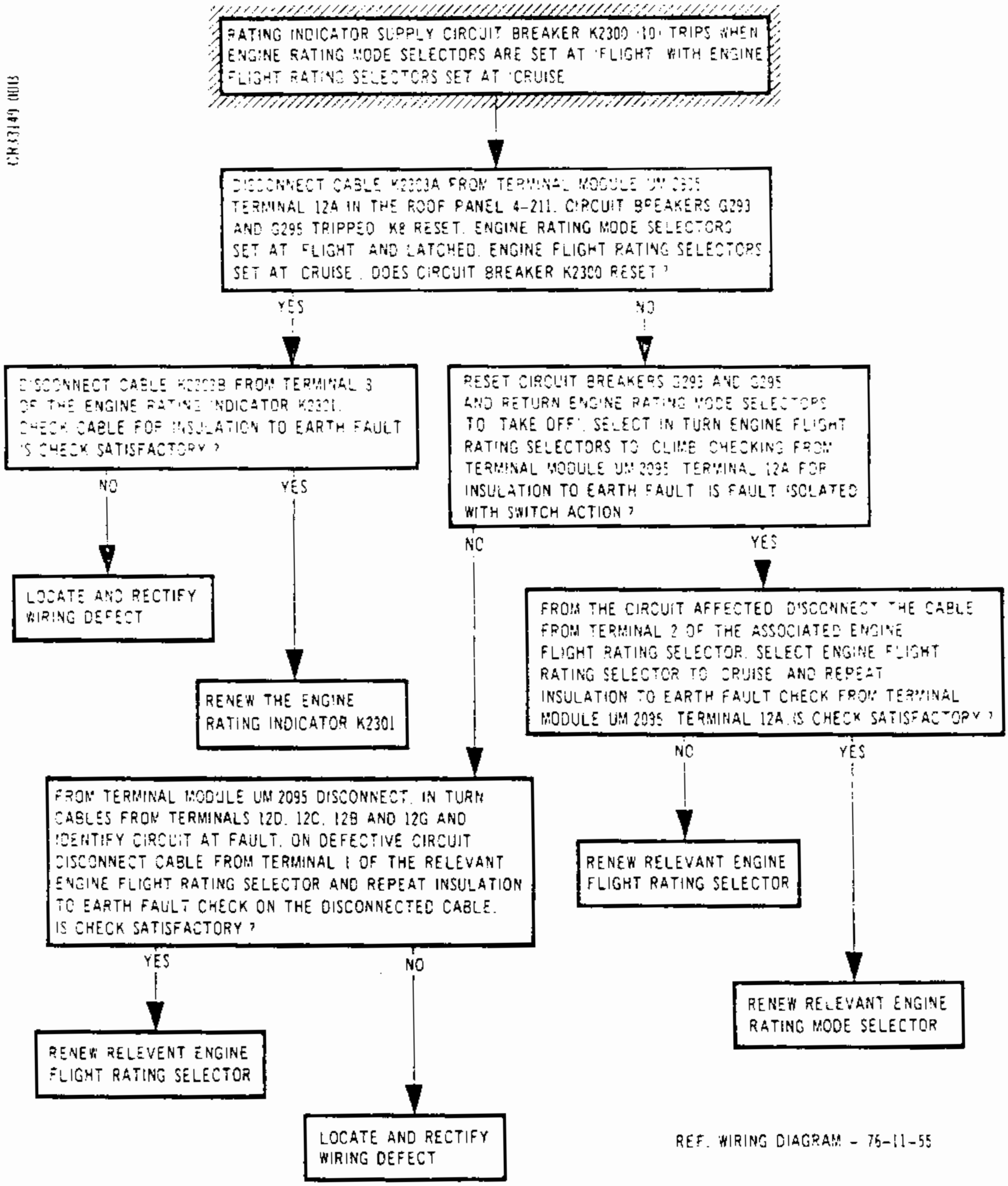
CR 33148 004



LOCATION OF RELAYS K133 AND K134 -

	LOCATION	WIRING DIAGRAM
ENGINE 1	19-123	73-21-11
ENGINE 2	19-123	73-21-12
ENGINE 3	20-123	73-21-13
ENGINE 4	20-123	73-21-14

Chart 114



REF. WIRING DIAGRAM - 76-11-55

Chart 115

CR 33150 008

ENGINE CONTROL SCHEDULE SUPPLY 1 CIRCUIT BREAKER K34 (2) TRIPPED AND FAILS TO RESET. ENGINE CONTROL SCHEDULE SELECTORS SET AT 'AUTO' AND 'NORMAL'

ADC1 CIRCUIT BREAKERS 1F73 AND 1F74 RESET. ADC1 SWITCH ON. TEST SELECTOR 'NORM'. AMBER FAILURE WARNING CANCELLED. TURN ADC1 TEST SELECTOR TO POSITION 1. CONFIRM BLUE 'TEST' CAPTION LIGHT ILLUMINATED. PRESS CAPTION FACE TO CANCEL AUDIO WARNING. DOES CIRCUIT BREAKER K34 RESET ?

YES

DEFECT BETWEEN ADC1 CONNECTOR B22 AND NASU 1 CONNECTOR A21. REMOVE NASU 1 FROM ZONE 10-215 RACKING. IDENT K1123. ADC1 SWITCH ON. TEST SELECTOR 'NORM' DOES CIRCUIT BREAKER K34 RESET ?

YES

RENEW NASU 1

NO

REMOVE ADC1 FROM ZONE 6-215 RACKING IDENT 1F71. LOCATE AND RECTIFY INSULATION TO EARTH FAULT IN CABLE BETWEEN CONNECTOR B22 OF ADC1 AND NASU 1 CONNECTOR A21. IF NO DEFECT FOUND, RENEW ADC1

NO

ENGINE CONTROL SCHEDULE SELECTOR SET TO 'HI' DOES CIRCUIT BREAKER K34 RESET ?

YES

DEFECT BETWEEN ENGINE CONTROL SCHEDULE SELECTOR TERMINAL 3 AND NASU 1 CONNECTOR B15. REMOVE NASU 1 FROM ZONE 10-215 RACKING. IDENT K1123. ENGINE CONTROL SCHEDULE SET TO 'AUTO'. DOES CIRCUIT BREAKER K34 RESET ?

YES

RENEW NASU 1

NO

LOCATE AND RECTIFY INSULATION TO EARTH FAULT IN CABLE BETWEEN ENGINE CONTROL SCHEDULE SELECTOR TERMINAL 3 AND NASU 1 CONNECTOR B15. IF NO DEFECT FOUND, RENEW ENGINE CONTROL SCHEDULE SELECTOR

NO

GAIN ACCESS TO TERMINAL MODULE UM 2131 IN PANEL 1-214 UPPER POWER MANAGEMENT DISCONNECT CABLE FROM TERMINAL 6A DOES CIRCUIT BREAKER K34 RESET ?

NO

LOCATE AND RECTIFY INSULATION TO EARTH FAULT IN WIRING BETWEEN TERMINAL 2 OF CIRCUIT BREAKER K34 TO ADC1 CONNECTOR B23 AND TO TERMINAL MODULE UM 2131 TERMINAL 6A. IF NO DEFECT FOUND IN WIRING RENEW CIRCUIT BREAKER K34

YES

DEFECT BETWEEN TERMINAL MODULE UM 2131 AND ENGINE CONTROL SCHEDULE LIGHTS INDICATOR. THIS UNIT IS SUPPLIED WITH WIRE TAILS WHICH CONNECT DIRECT TO TERMINAL MODULE UM 2131. RENEW ENGINE CONTROL SCHEDULE LIGHTS INDICATOR

REF. WIRING DIAGRAM - 76-11-71 AND 76-11-81

chart 116

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CR 33151 00R

ENGINE CONTROL SCHEDULE SUPPLY 2 CIRCUIT BREAKER K35 (1) TRIPPED AND FAILS TO RESET. ENGINE CONTROL SCHEDULE SELECTORS SET AT 'AUTO' AND 'NORMAL'

ADC2 CIRCUIT BREAKERS 2F73 AND 2F74 RESET. ADC2 SWITCH ON. TEST SELECTOR 'NORM' AMBER FAILURE WARNING CANCELLED. TURN ADC2 TEST SELECTOR TO POSITION 1. CONFIRM BLUE 'TEST' CAPTION LIGHT ILLUMINATED. PRESS CAPTION FACE TO CANCEL AUDIO WARNING. DOES CIRCUIT BREAKER K35 RESET ?

YES

DEFECT BETWEEN ADC2 CONNECTOR B22 AND NASU 2 CONNECTOR A21. REMOVE NASU 2 FROM ZONE 1-216 RACKING. IDENT K1124. REMOVE ADC2 FROM ZONE 6-216 RACKING. IDENT 2F71. LOCATE AND RECTIFY INSULATION TO EARTH FAULT IN CABLE BETWEEN CONNECTOR B22 OF ADC2 AND NASU 2 CONNECTOR A21. IF NO DEFECT FOUND, RENEW NASU 2

NO

ENGINE CONTROL SCHEDULE SELECTOR SET TO 'HI'. DOES CIRCUIT BREAKER K35 RESET ?

NO

YES

DEFECT BETWEEN ENGINE CONTROL SCHEDULE SELECTOR TERMINAL 6 AND NASU 2 CONNECTOR B15. REMOVE NASU 2 FROM ZONE 1-216 RACKING. IDENT K1124. DISCONNECT CABLE FROM ENGINE CONTROL SCHEDULE SELECTOR TERMINAL 6. LOCATE AND RECTIFY INSULATION TO EARTH FAULT IN WIRING BETWEEN SELECTOR AND NASU 2 CONNECTOR B15 AT ZONE 1-216 RACKING. IF NO DEFECT FOUND, RENEW NASU 2

Sheet 117 (Sheet 1 of 2)

CR 33339 00B

REMOVE ADC2 FROM ZONE 6-216 RACKING. ENGINE CONTROL SCHEDULE SELECTOR SET TO 'HI'. DOES CIRCUIT BREAKER K35 RESET ?

YES

RENEW ADC2

NO

GAIN ACCESS TO TERMINAL BLOCK UM 2128 IN UPPER POWER MANAGEMENT PANEL 1-214 AND DISCONNECT CABLE FROM TERMINAL 5A DOES CIRCUIT BREAKER K35 RESET ?

YES

LOCATE AND RECTIFY INSULATION TO EARTH FAULT IN CABLE BETWEEN TERMINAL MODULE UM 2128 TERMINAL 5A AND ADC2 CONNECTOR B23 IN RACKING 6-216. IF NO DEFECT FOUND, RENEW ENGINE CONTROL SCHEDULE SELECTOR

NO

DISCONNECT CABLE FROM TERMINAL 6A OF TERMINAL MODULE UM 2128. DOES CIRCUIT BREAKER K35 RESET ?

YES

DEFECT BETWEEN TERMINAL MODULE UM 2128 AND ENGINE CONTROL SCHEDULE LIGHTS INDICATOR. THIS UNIT IS SUPPLIED WITH WIRE TAILS WHICH CONNECT DIRECT TO UM 2128. RENEW ENGINE CONTROL SCHEDULE LIGHTS INDICATOR

NO

DEFECT BETWEEN TERMINAL 2 OF CIRCUIT BREAKER K35, PANEL 3-213 AND TERMINAL 6A OF TERMINAL MODULE UM 2128 IN UPPER POWER MANAGEMENT PANEL 1-214. IF NO DEFECT FOUND IN CABLE, RENEW CIRCUIT BREAKER K35

REF. WIRING DIAGRAMS – 76-11-72 AND 76-11-81

Chart 117 (Sheet 2 of 2)

CR 11152 008

RATING INDICATOR SUPPLY CIRCUIT BREAKER K2300 (10) TRIPS WHEN 'CTY' (CONTINGENCY) IS SELECTED. REFER TO WIRING DIAGRAM 76-11-55

REHEAT SELECTORS SET TO 'OFF'. RESET CIRCUIT BREAKER K2300 (10) SELECT IN TURN INDIVIDUALLY REHEAT SELECTOR 1 TO 4 FROM 'OFF' TO 'CONTINGENCY' THEN RETURN TO 'OFF'. IF CIRCUIT BREAKER TRIPS WHEN A SINGLE REHEAT SELECTOR IS SET TO 'CONTINGENCY', RENEW THE RELEVANT REHEAT SELECTOR

IF CIRCUIT BREAKER K2300 (10) TRIPS WHEN ANY ONE OF THE FOUR REHEAT SELECTORS ARE SET TO 'CONTINGENCY' REFER TO WIRING DIAGRAM 76-11-55. CHECK WIRING BETWEEN TERMINAL 3 OF NO.1 REHEAT SELECTOR AND TERMINAL 4 OF REHEAT SELECTOR NO.4 IS CHECK SATISFACTORY ?

- YES: CHECK WIRING K2308H BETWEEN TERMINAL 9 OF REHEAT SELECTOR NO.1 AND TERMINAL MODULE UG 2027 TERMINAL 3 IN 10-211 DASH PANEL SUPPORT STRUCTURE. IS CHECK SATISFACTORY ?
- NO: LOCATE AND RECTIFY INSULATION TO EARTH FAULT

CHECK WIRING K2308H ... IS CHECK SATISFACTORY ?

- YES: CHECK WIRING K2308G FROM TERMINAL MODULE UG 2027 TERMINAL 3 TO INDICATOR MODE SELECTED MODULE K2301 TERMINAL 2 IN ZONE 2-211. IS CHECK SATISFACTORY ?
- NO: LOCATE AND RECTIFY INSULATION TO EARTH FAULT

CHECK WIRING K2308G ... IS CHECK SATISFACTORY ?

- YES: CHECK INDICATOR MODE SELECTED MODULE K2301. IS CHECK SATISFACTORY ?
- NO: LOCATE AND RECTIFY INSULATION TO EARTH FAULT

CHECK INDICATOR MODE SELECTED MODULE K2301. IS CHECK SATISFACTORY ?

- YES: CHECK WIRING K2308J FROM TERMINAL MODULE UG 2207 TERMINAL 3 TO THE RACKING RELAY BOX 11-123 PLUG RECEPTACLE U 1922 U. IS CHECK SATISFACTORY ?
- NO: RENEW INDICATOR MODE SELECTED MODULE K2301

CHECK WIRING K2308J ... IS CHECK SATISFACTORY ?

- YES: CHECK FLASHER UNIT K117 WITHIN 11-123 RACKING. RENEW IF FOUND DEFECTIVE
- NO: LOCATE AND RECTIFY INSULATION TO EARTH FAULT

Chart 118

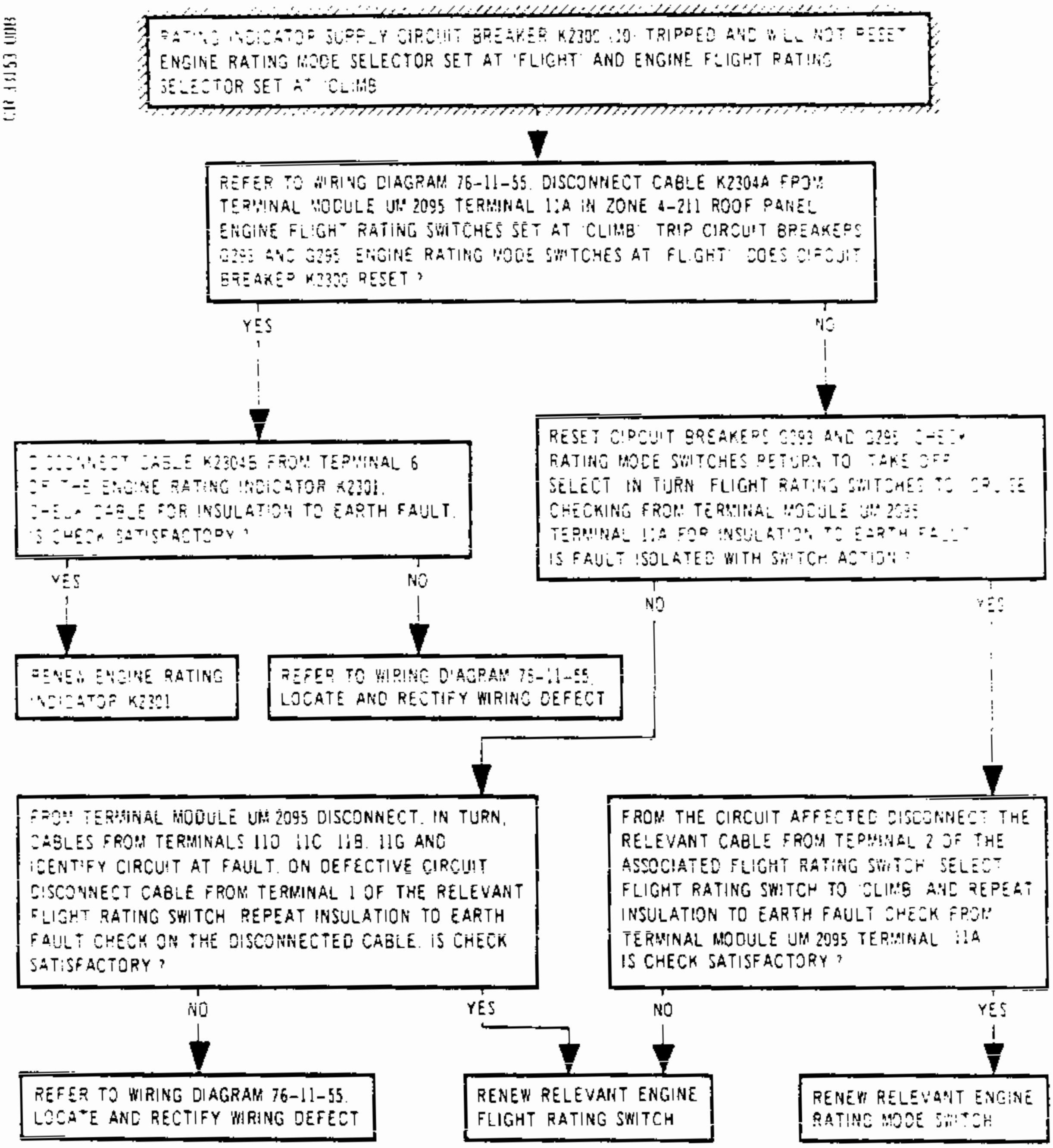
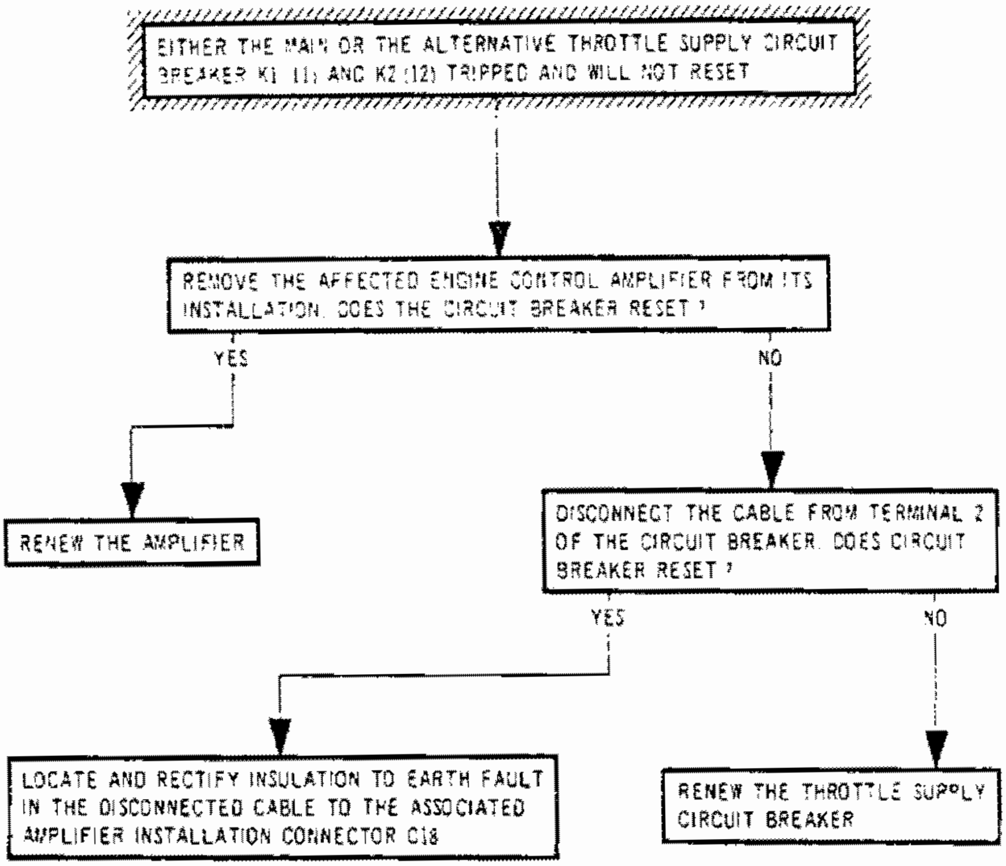

RATING INDICATOR SUPPLY CIRCUIT BREAKER K2300 (30) TRIPPED AND WILL NOT RESET ENGINE RATING MODE SELECTOR SET AT 'FLIGHT' AND ENGINE FLIGHT RATING SELECTOR SET AT 'CLIMB'
REFER TO WIRING DIAGRAM 76-11-55. DISCONNECT CABLE K2304A FROM TERMINAL MODULE UM 2095 TERMINAL 11A IN ZONE 4-211 ROOF PANEL. ENGINE FLIGHT RATING SWITCHES SET AT 'CLIMB'. TRIP CIRCUIT BREAKERS G293 AND G295. ENGINE RATING MODE SWITCHES AT 'FLIGHT'. DOES CIRCUIT BREAKER K2300 RESET ?
YES
NO
DISCONNECT CABLE K2304B FROM TERMINAL 6 OF THE ENGINE RATING INDICATOR K2301. CHECK CABLE FOR INSULATION TO EARTH FAULT. IS CHECK SATISFACTORY ?
RESET CIRCUIT BREAKERS G293 AND G295. CHECK RATING MODE SWITCHES RETURN TO 'TAKE OFF'. SELECT, IN TURN, FLIGHT RATING SWITCHES TO 'CRUISE' CHECKING FROM TERMINAL MODULE UM 2095 TERMINAL 11A FOR INSULATION TO EARTH FAULT. IS FAULT ISOLATED WITH SWITCH ACTION ?
YES
NO
NO
YES
RENEW ENGINE RATING INDICATOR K2301
REFER TO WIRING DIAGRAM 76-11-55. LOCATE AND RECTIFY WIRING DEFECT
FROM TERMINAL MODULE UM 2095 DISCONNECT, IN TURN, CABLES FROM TERMINALS 11D, 11C, 11B, 11G AND IDENTIFY CIRCUIT AT FAULT. ON DEFECTIVE CIRCUIT DISCONNECT CABLE FROM TERMINAL 1 OF THE RELEVANT FLIGHT RATING SWITCH. REPEAT INSULATION TO EARTH FAULT CHECK ON THE DISCONNECTED CABLE. IS CHECK SATISFACTORY ?
FROM THE CIRCUIT AFFECTED DISCONNECT THE RELEVANT CABLE FROM TERMINAL 2 OF THE ASSOCIATED FLIGHT RATING SWITCH. SELECT FLIGHT RATING SWITCH TO 'CLIMB' AND REPEAT INSULATION TO EARTH FAULT CHECK FROM TERMINAL MODULE UM 2095 TERMINAL 11A. IS CHECK SATISFACTORY ?
NO
YES
NO
YES
REFER TO WIRING DIAGRAM 76-11-55. LOCATE AND RECTIFY WIRING DEFECT
RENEW RELEVANT ENGINE FLIGHT RATING SWITCH
RENEW RELEVANT ENGINE RATING MODE SWITCH

Chart 119

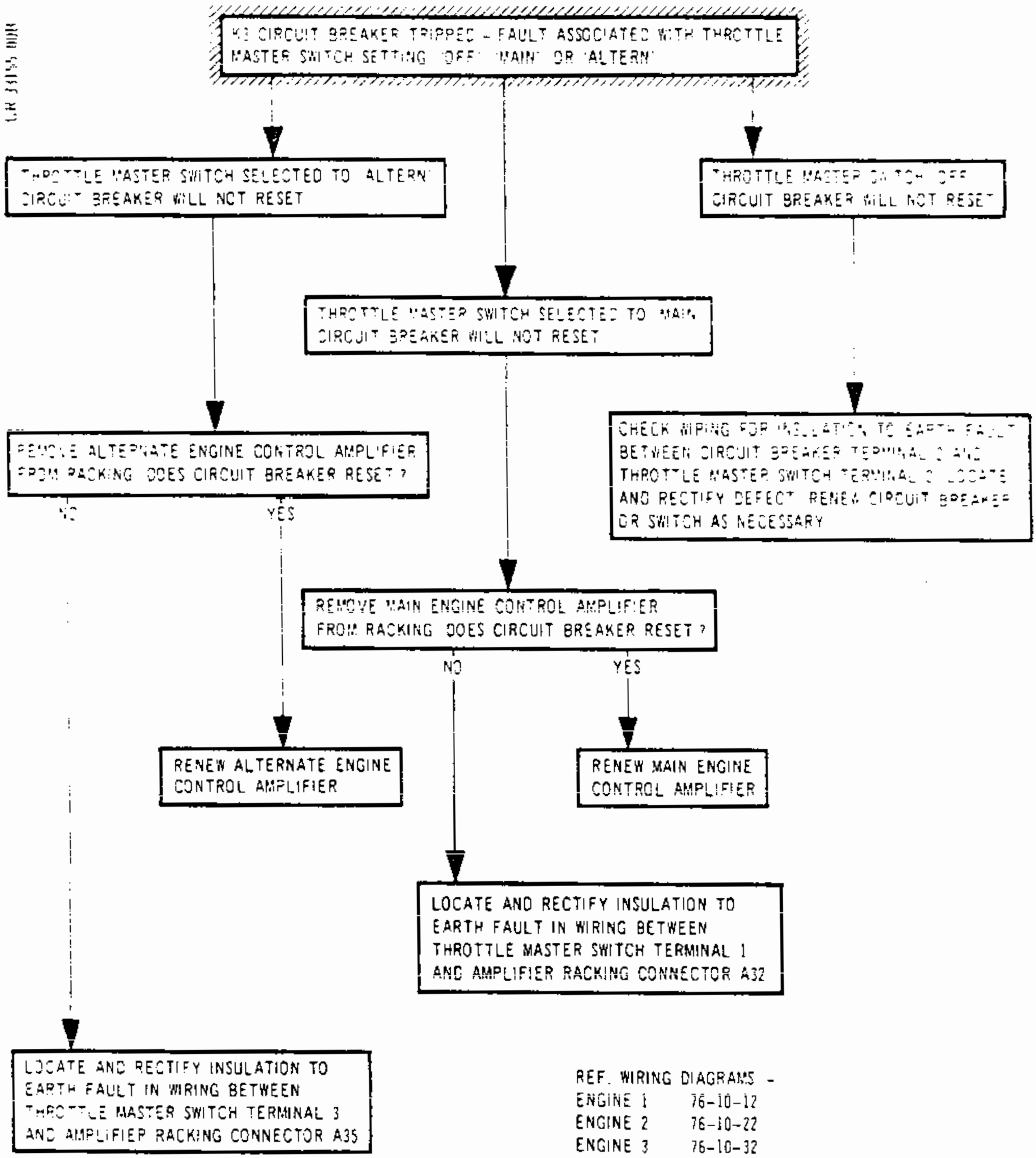
CR 33154 008



REF. WIRING DIAGRAM :-

ENGINE 1	76-10-11
ENGINE 2	76-10-21
ENGINE 3	76-10-31
ENGINE 4	76-10-41

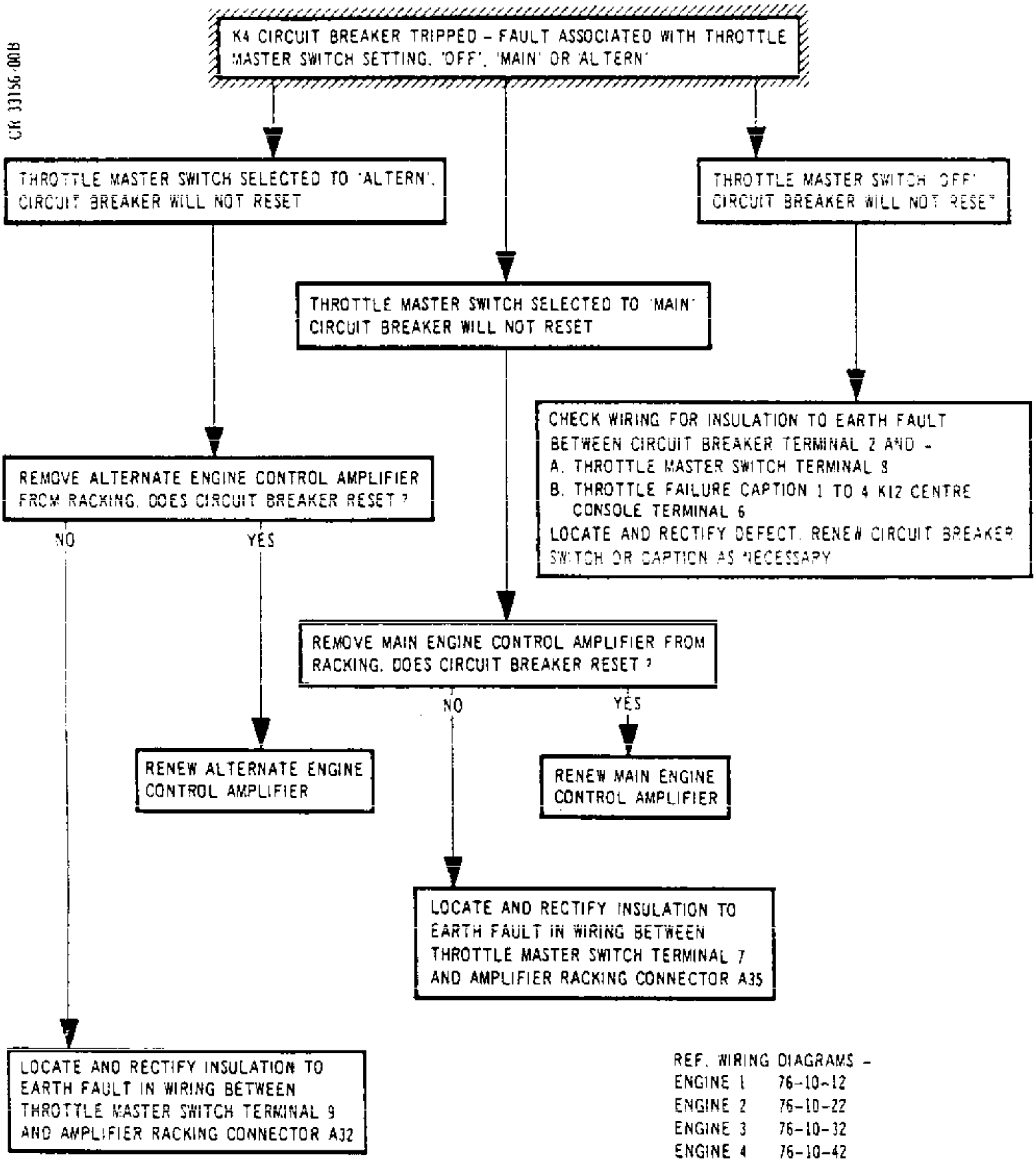
Chart 120



REF. WIRING DIAGRAMS -

ENGINE 1	76-10-12
ENGINE 2	76-10-22
ENGINE 3	76-10-32
ENGINE 4	76-10-42

Chart 121



CR 33156 00B

REF. WIRING DIAGRAMS -

ENGINE 1	76-10-12
ENGINE 2	76-10-22
ENGINE 3	76-10-32
ENGINE 4	76-10-42

Chart 122

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CR 33157 00B

LOSS OF ALL THROTTLE FAILURE INDICATIONS – DISCLOSED DURING MAINTENANCE CHECKS OF THE ENGINE CONTROL AMPLIFIER SAFETY SYSTEM USING THE TEST SET AND PROCEDURE OF 76-11-00, ADJUSTMENT TEST

IS SYMPTOM ASSOCIATED WITH BOTH MAIN AND ALTERN AMPLIFIERS ?

YES

CHECK FOR CONTINUITY BETWEEN THE RELEVANT THROTTLE MASTER SWITCH TERMINAL 5 AND THE ASSOCIATED CONNECTOR ON THE ENGINE RELAY PANEL AT ZONE 123.

	RELAY BOX	CONNECTOR
ENGINE 1	19-123 LH	U-1867 H
ENGINE 2	19-123 LH	U-1869 H
ENGINE 3	20-123 RH	U-1868 H
ENGINE 4	20-123 RH	U-1870 H

CHECK FOR CONTINUITY ACROSS DIODE K13 IN THE RELAY BOX AT ZONE 123. LOCATE AND RECTIFY WIRING FAULT. RENEW DIODE K13 IF FOUND DEFECTIVE

NO

ASCERTAIN TO WHICH OF THE AMPLIFIERS (MAIN OR ALTERN) THE SYMPTOMS RELATE IS THE MAIN AMPLIFIER THE ONE AFFECTED ?

NO

YES

THROTTLE MASTER SWITCH SET AT 'MAIN', CIRCUIT BREAKER K4 RESET AND TRIP CIRCUIT BREAKER K3. CONNECT A TEST METER TO TEST SOCKET 2 OF THE MAIN AMPLIFIER CONNECTOR 107. IS 28 VOLT SUPPLY AVAILABLE ?

YES

RENEW MAIN AMPLIFIER

NO

CHECK FOR CONTINUITY BETWEEN THE MAIN AMPLIFIER CONNECTOR A20 AND TERMINAL 4 OF THE THROTTLE MASTER SWITCH. SET THROTTLE MASTER SWITCH TO 'MAIN' AND CHECK FOR CONTINUITY BETWEEN SWITCH TERMINALS 4 AND 5. LOCATE AND RECTIFY WIRING FAULT, RENEW THROTTLE MASTER SWITCH IF FOUND DEFECTIVE.

Chart 123 (Sheet 1 of 2)

CR 33342/00B

REF. WIRING DIAGRAMS –
ENGINE 1   76-10-12
ENGINE 2   76-10-22
ENGINE 3   76-10-32
ENGINE 4   76-10-42

NO

THROTTLE MASTER SWITCH SET AT 'ALTERN'. CIRCUIT BREAKER K3 RESET AND TRIP CIRCUIT BREAKER K4. CONNECT A TEST METER TO TEST SOCKET 2 OF THE ALTERN AMPLIFIER CONNECTOR 107. IS 28 VOLT SUPPLY AVAILABLE ?

YES

RENEW ALTERN AMPLIFIER

NO

CHECK FOR CONTINUITY BETWEEN THE ALTERN AMPLIFIER CONNECTOR A20 AND TERMINAL 6 OF THE THROTTLE MASTER SWITCH. SET THROTTLE MASTER SWITCH TO 'ALTERN' AND CHECK FOR CONTINUITY BETWEEN SWITCH TERMINALS 5 AND 6. LOCATE AND RECTIFY WIRING FAULT, RENEW THROTTLE MASTER SWITCH IF FOUND DEFECTIVE

Chart 123 (Sheet 2 of 2)

CR 33158 00B

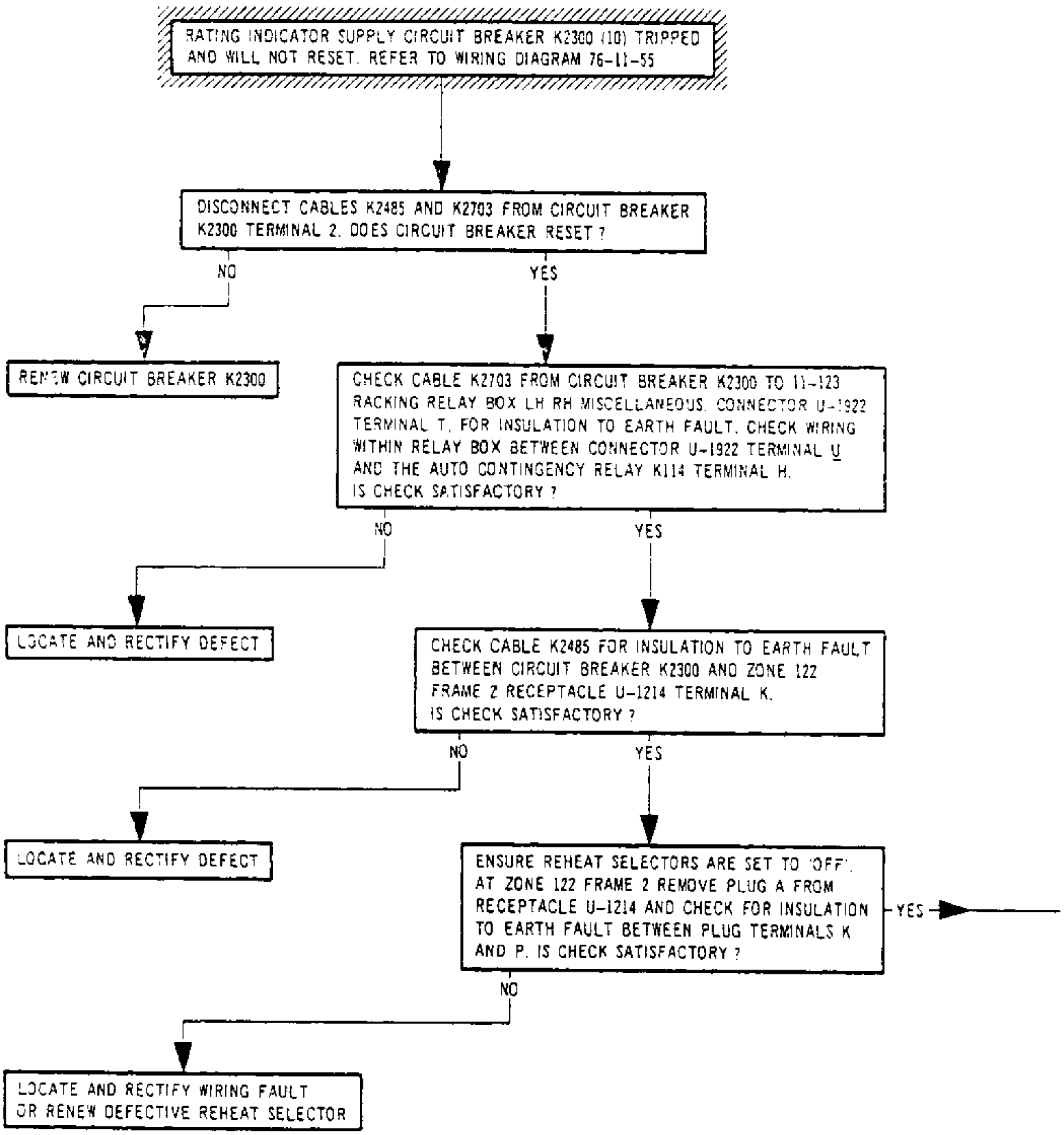

Chart 124 (Sheet 1 of 2)

CR 35853 00A

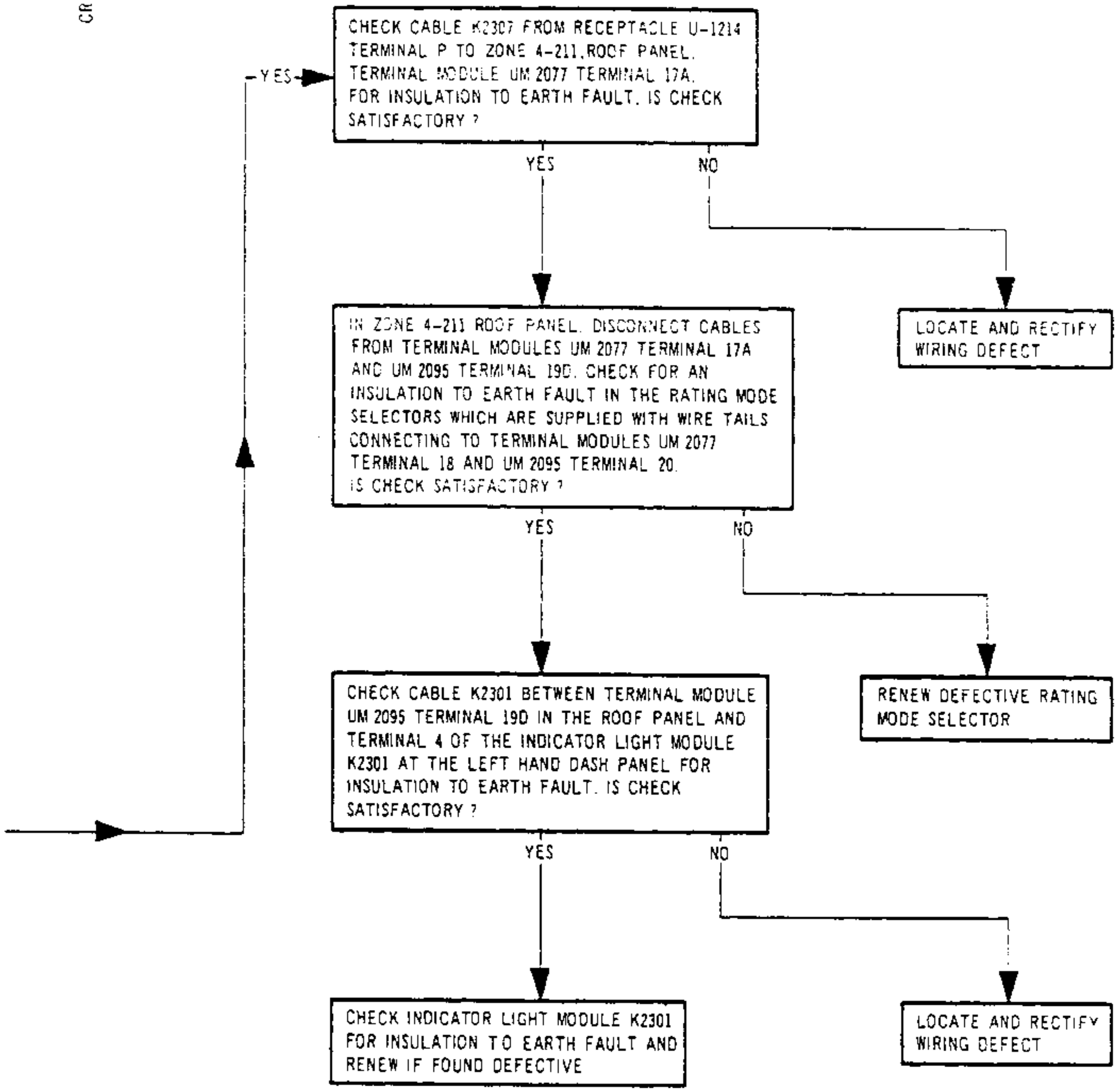

Chart 124 (Sheet 2 of 2)

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CR 33159 08B

ALTERNATIVE THROTTLE FAILURE INDICATION AND REVERSE SCHEDULE SUPPLY CIRCUIT BREAKER (9) TRIPPED AND WILL NOT RESET

DISCONNECT CABLE K67 FROM CIRCUIT BREAKER (9) TERMINAL 2. DOES CIRCUIT BREAKER RESET ?

YES

GAIN ACCESS TO THE ASSOCIATED RELAY BOX, ENGINES 1 AND 2 AT ZONE 19-123 AND ENGINES 3 AND 4 AT ZONE 20-123. DISCONNECT CABLE FROM THE TERMINAL MODULE (35) CONNECTOR A. CHECK CABLE FOR INSULATION TO EARTH FAULT BETWEEN THE RELAY BOX AND THE CIRCUIT BREAKER. IS CHECK SATISFACTORY ?

NO

RENEW CIRCUIT BREAKER

YES

CONFIRM HP VALVE SELECTORS SET AT 'SHUT', CIRCUIT BREAKERS 1 TO 4 K13) RESET. RELAY (26) ENERGISED. DISCONNECT CABLE FROM THE TERMINAL MODULE (35) CONNECTOR B AND CHECK WIRING FOR INSULATION TO EARTH FAULT. IS CHECK SATISFACTORY ?

NO

LOCATE AND RECTIFY WIRING DEFECT REFER TO APPROPRIATE WIRING DIAGRAM

YES

DISCONNECT CABLE FROM THE TERMINAL MODULE (35) CONNECTOR C AND CHECK WIRING FOR INSULATION TO EARTH FAULT. IS CHECK SATISFACTORY ?

NO

LOCATE AND RECTIFY DEFECT IN THE DISCONNECTED CABLE. RENEW HP VALVE RELAY (26) IF FOUND DEFECTIVE

YES

SYSTEM NORMAL

NO

LOCATE AND RECTIFY DEFECT IN THE DISCONNECTED CABLE. RENEW APPROPRIATE REVERSE SELECT RELAY (34)

REF. WIRING DIAGRAMS :-
ENGINE 1 76-10-11 AND 73-21-11
ENGINE 2 76-10-21 AND 73-21-12
ENGINE 3 76-10-31 AND 73-21-13
ENGINE 4 76-10-41 AND 73-21-14

Chart 125

CR 33160 008

THROTTLE FAILURE CIRCUIT BREAKERS K5 (8) AND K6 (9) TRIP WHEN HP VALVE SWITCH IS SET TO 'OPEN' WITH THROTTLE MASTER SWITCH SET AT 'OFF'

REMOVE ASSOCIATED ALTERNATIVE ENGINE CONTROL AMPLIFIER FROM THE RACKING. DO CIRCUIT BREAKERS RESET ?

NO

CHECK CABLE K66 BETWEEN ENGINE RELAY BOX PLUG-RECEPTACLE AND THE ASSOCIATED ALTERNATIVE RACKING CONNECTOR K21-A27 FOR INSULATION TO EARTH FAULT. LOCATE AND RECTIFY WIRING DEFECT

	RELAY BOX	PLUG-RECEPTACLE	CONNECTOR	WIRING DIAGRAM
ENGINE 1	19-123	U-1873	Y	76-10-11
ENGINE 2	19-123	U-1871	Y	76-10-21
ENGINE 3	20-123	U-1874	Y	76-10-31
ENGINE 4	20-123	U-1872	Y	76-10-41

YES

REMOVE MAIN AMPLIFIER AND INSTALL REMOVED ALTERNATIVE AMPLIFIER IN ITS ORIGINAL LOCATION. DO CIRCUIT BREAKERS RESET ?

NO

INTERCHANGE AMPLIFIERS. REMOVE ALTERNATIVE AMPLIFIER FROM ITS RACKING AND SUBSTITUTE MAIN AMPLIFIER. IF CIRCUIT BREAKERS WILL NOT RESET, CHECK CABLE K83 BETWEEN ALTERNATIVE RACKING CONNECTOR K21-A46 AND THE MAIN RACKING CONNECTOR K20-A27. IS CHECK SATISFACTORY ?

YES

RENEW ALTERNATIVE ENGINE CONTROL AMPLIFIER AND CONFIRM CIRCUIT BREAKERS RESET

NO

LOCATE AND RECTIFY WIRING DEFECT

YES

INSTALL MAIN AMPLIFIER IN ITS ORIGINAL LOCATION. IF CIRCUIT BREAKERS WILL NOT RESET, CHECK CABLE K73 BETWEEN RELEVANT ENGINE RELAY BOX PLUG-RECEPTACLE AND ASSOCIATED MAIN AMPLIFIER RACKING CONNECTOR K20-A46. IS CHECK SATISFACTORY ?

	RELAY BOX	PLUG RECEPTACLE	CONNECTOR	WIRING DIAGRAM
ENGINE 1	19-123	U-1871	C	76-10-12
ENGINE 2	19-123	U-1873	C	76-10-22
ENGINE 3	20-123	U-1872	C	76-10-32
ENGINE 4	20-123	U-1874	C	76-10-42

NO

LOCATE AND RECTIFY WIRING DEFECT

YES

RENEW MAIN ENGINE CONTROL AMPLIFIER AND CONFIRM CIRCUIT BREAKERS RESET

REF. WIRING DIAGRAMS :-
ENGINE 1 76-10-11 AND 76-10-12
ENGINE 2 76-10-21 AND 76-10-22
ENGINE 3 76-10-31 AND 76-10-32
ENGINE 4 76-10-41 AND 76-10-42

Chart 126

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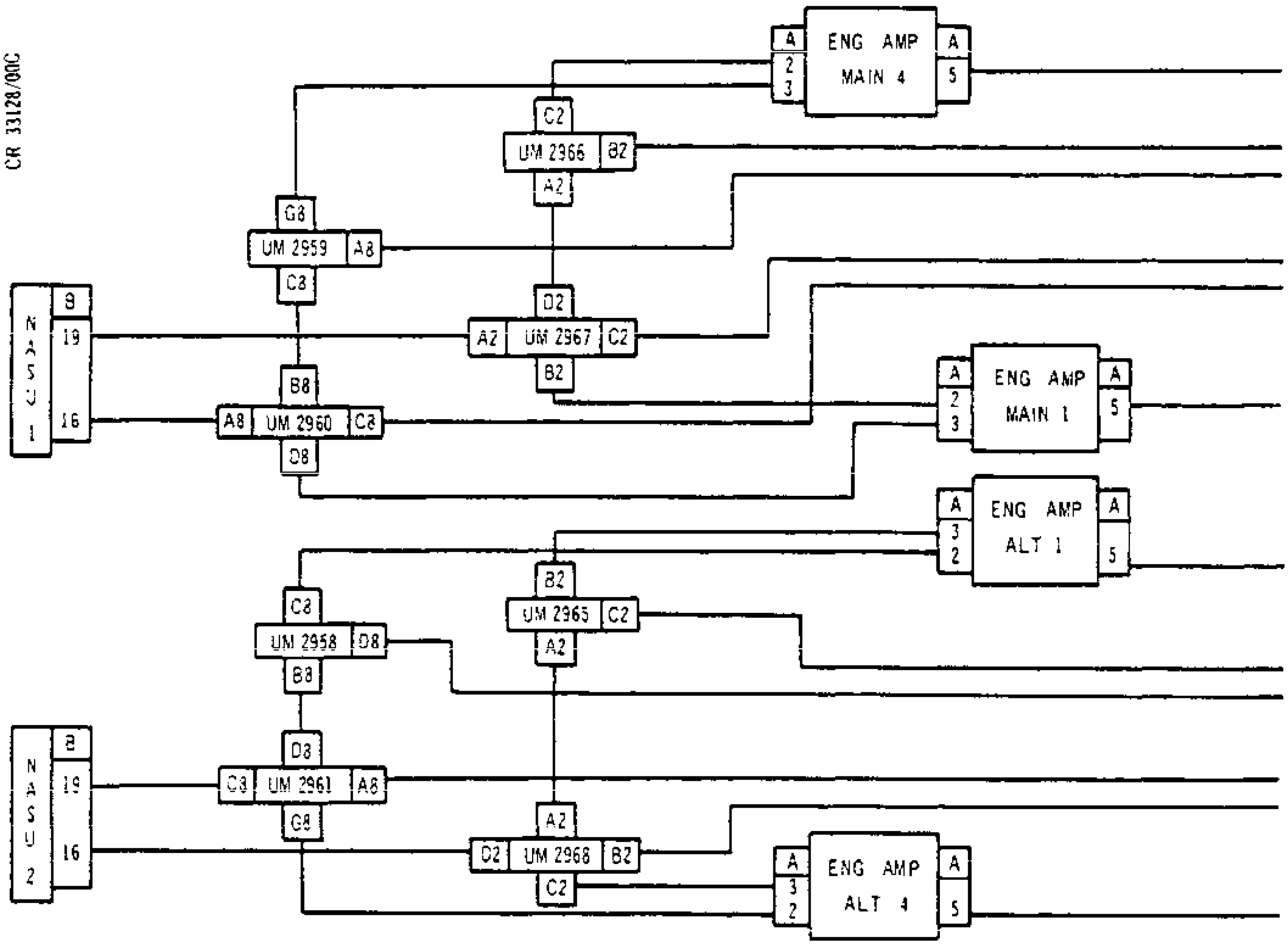
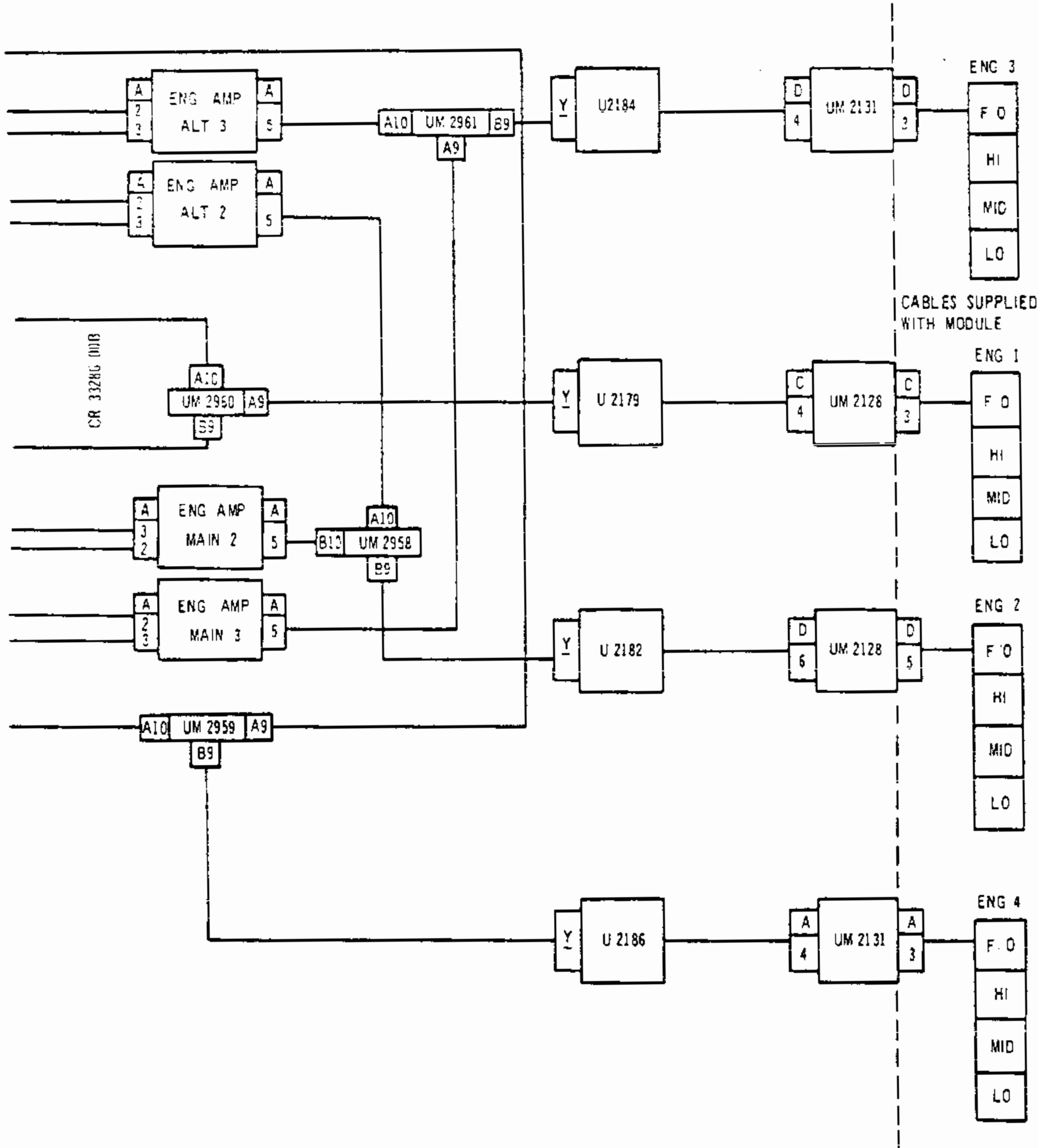
CR 33128/00C



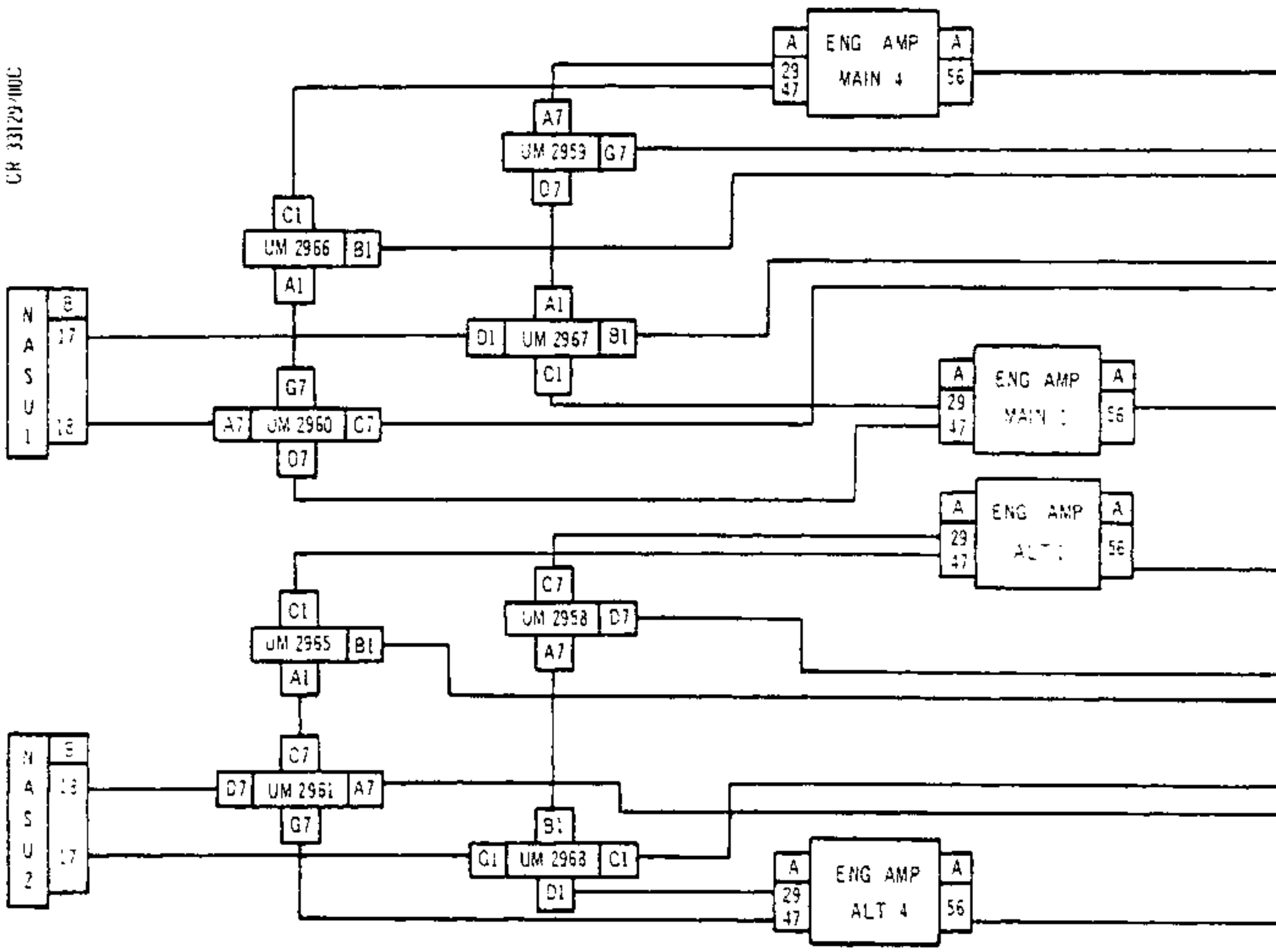
LOCATION OF COMPONENTS			
COMPONENT	BAY	COMPONENT	BAY
NASU 1	10-215	CONNECTOR PLUG U 2179	9-214
NASU 2	1-216	CONNECTOR PLUG U 2182	9-214
TERMINAL BLOCK UM 2960	8-215	CONNECTOR PLUG U 2184	9-214
TERMINAL BLOCK UM 2967	8-215	CONNECTOR PLUG U 2186	9-214
TERMINAL BLOCK UM 2966	6-216	TERMINAL BLOCK UM 2128	1-214
TERMINAL BLOCK UM 2959	6-216	TERMINAL BLOCK UM 2131	1-214
TERMINAL BLOCK UM 2961	8-216	MAIN CONTROL AMP NO.1	8-215
TERMINAL BLOCK UM 2968	8-216	MAIN CONTROL AMP NO.2	6-215
TERMINAL BLOCK UM 2965	6-215	MAIN CONTROL AMP NO.3	8-216
TERMINAL BLOCK UM 2958	6-215	MAIN CONTROL AMP NO.4	6-216
'E' SCHEDULE IND LIGHT MODULE ENGINE 1	1-214	ALTERN CONTROL AMP NO.1	6-215
'E' SCHEDULE IND LIGHT MODULE ENGINE 2	1-214	ALTERN CONTROL AMP NO.2	8-215
'E' SCHEDULE IND LIGHT MODULE ENGINE 3	1-214	ALTERN CONTROL AMP NO.3	6-216
'E' SCHEDULE IND LIGHT MODULE ENGINE 4	1-214	ALTERN CONTROL AMP NO.4	8-216

Engine Control Schedule 'Flyover' Circuit Diagram
Figure 101 (Sheet 1 of 2)



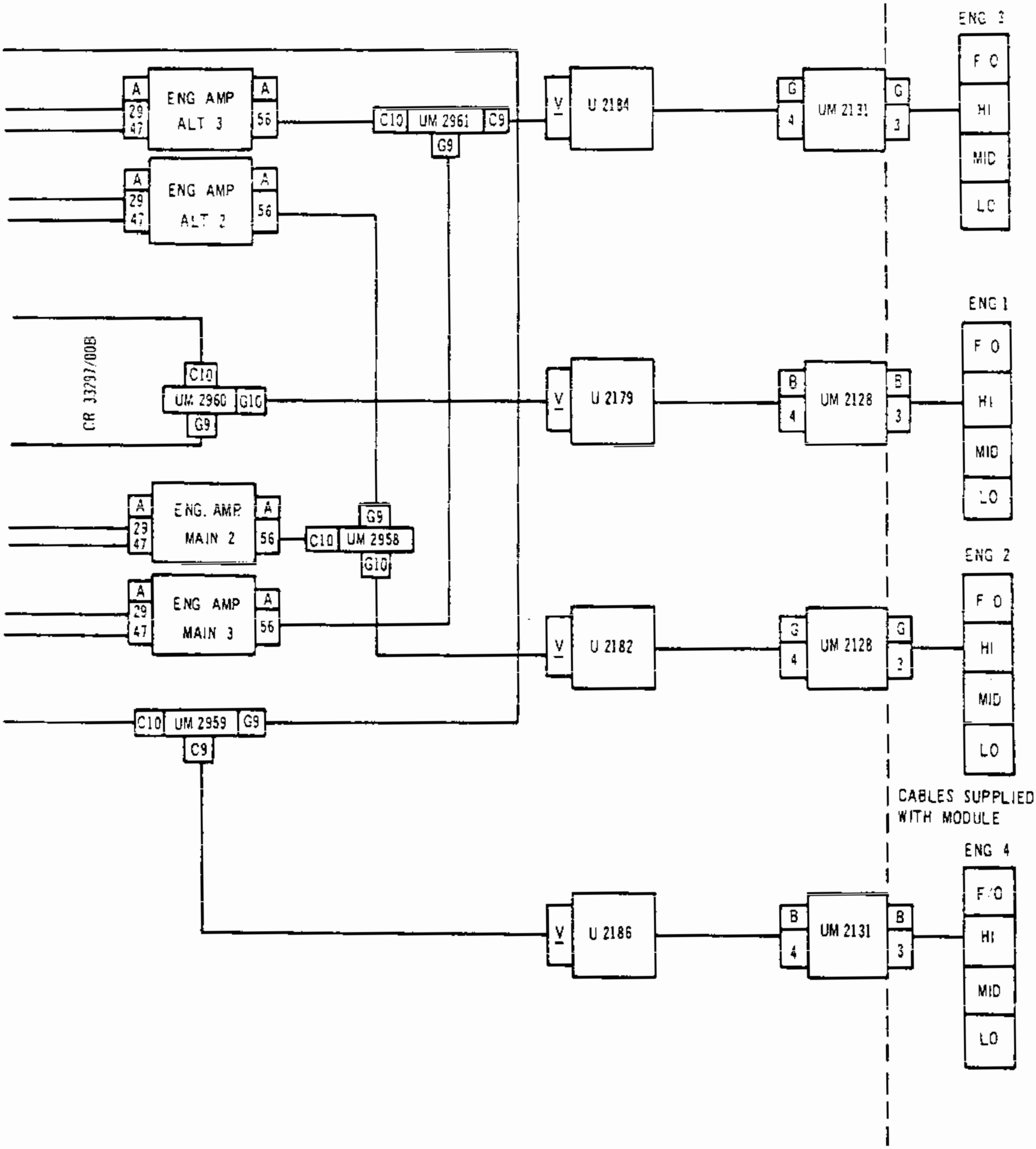
Engine Control Schedule 'Flyover' Circuit Diagram
Figure 101 (Sheet 2 of 2)

CR 33129/10C

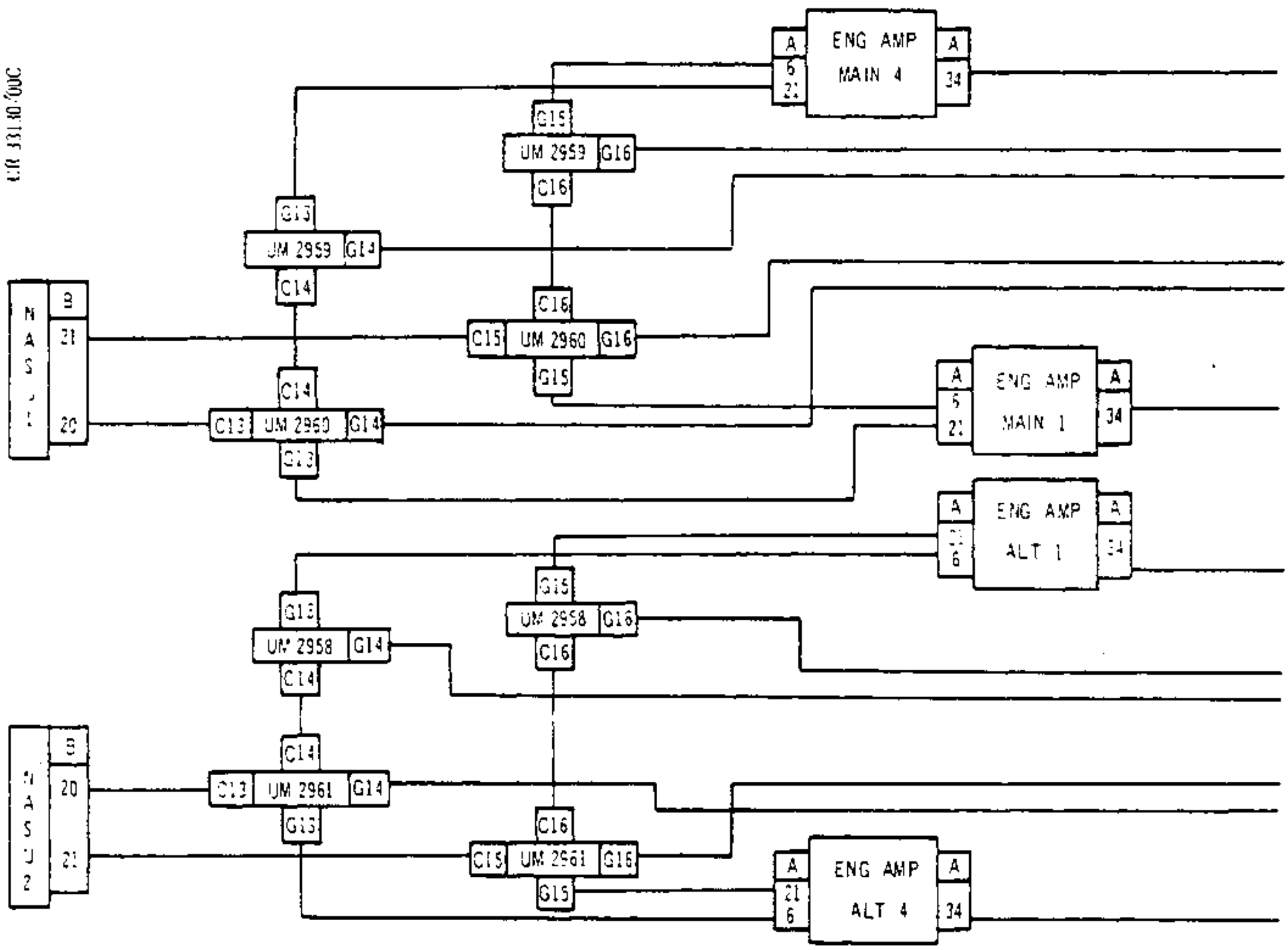


LOCATION OF COMPONENTS			
COMPONENT	BAY	COMPONENT	BAY
NASU 1	10-215	CONNECTOR PLUG U 2179	9-214
NASU 2	1-216	CONNECTOR PLUG U 2182	9-214
TERMINAL BLOCK UM 2960	8-215	CONNECTOR PLUG U 2184	9-214
TERMINAL BLOCK UM 2967	8-215	CONNECTOR PLUG U 2186	9-214
TERMINAL BLOCK UM 2966	6-216	TERMINAL BLOCK UM 2128	1-214
TERMINAL BLOCK UM 2959	6-216	TERMINAL BLOCK UM 2131	1-214
TERMINAL BLOCK UM 2961	8-216	MAIN CONTROL AMP NO.1	8-215
TERMINAL BLOCK UM 2968	8-216	MAIN CONTROL AMP NO.2	6-215
TERMINAL BLOCK UM 2965	6-215	MAIN CONTROL AMP NO.3	8-216
TERMINAL BLOCK UM 2958	6-215	MAIN CONTROL AMP NO.4	6-216
'E' SCHEDULE IND LIGHT MODULE ENGINE 1	1-214	ALTERN CONTROL AMP NO.1	6-215
'E' SCHEDULE IND LIGHT MODULE ENGINE 2	1-214	ALTERN CONTROL AMP NO.2	8-215
'E' SCHEDULE IND LIGHT MODULE ENGINE 3	1-214	ALTERN CONTROL AMP NO.3	6-216
'E' SCHEDULE IND LIGHT MODULE ENGINE 4	1-214	ALTERN CONTROL AMP NO.4	8-216

Engine Control Schedule 'High' Circuit Diagram
Figure 102 (Sheet 1 of 2)

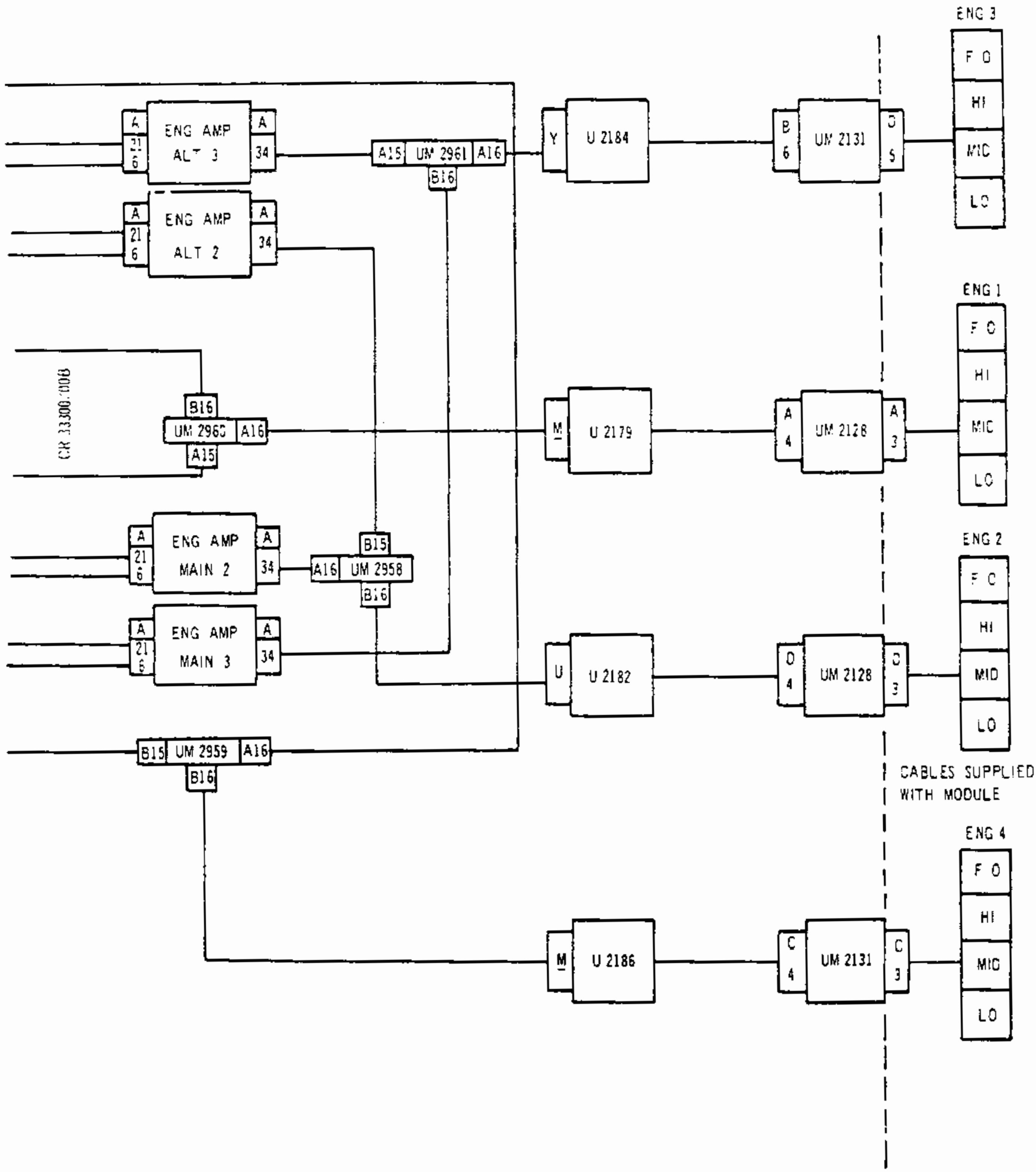


Engine Control Schedule 'High' Circuit Diagram
Figure 102 (Sheet 2 of 2)



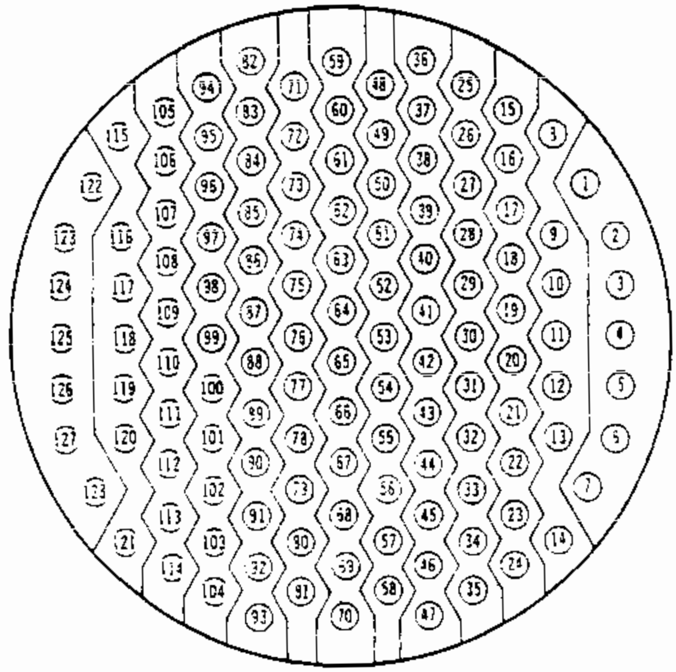
LOCATION OF COMPONENTS			
COMPONENT	BAY	COMPONENT	BAY
NASU 1	10-215	CONNECTOR PLUG U 2179	9-214
NASU 2	1-216	CONNECTOR PLUG U 2182	9-214
TERMINAL BLOCK UM 2960	8-215	CONNECTOR PLUG U 2184	9-214
TERMINAL BLOCK UM 2967	8-215	CONNECTOR PLUG U 2186	9-214
TERMINAL BLOCK UM 2966	6-216	TERMINAL BLOCK UM 2128	1-214
TERMINAL BLOCK UM 2959	6-216	TERMINAL BLOCK UM 2131	1-214
TERMINAL BLOCK UM 2961	8-216	MAIN CONTROL AMP No 1	8-215
TERMINAL BLOCK UM 2968	8-216	MAIN CONTROL AMP No 2	5-215
TERMINAL BLOCK UM 2965	6-215	MAIN CONTROL AMP No 3	8-216
TERMINAL BLOCK UM 2958	6-215	MAIN CONTROL AMP No 4	6-216
'E' SCHEDULE IND LIGHT MODULE ENGINE 1	1-214	ALTERN CONTROL AMP No 1	6-215
'E' SCHEDULE IND LIGHT MODULE ENGINE 2	1-214	ALTERN CONTROL AMP No 2	8-215
'E' SCHEDULE IND LIGHT MODULE ENGINE 3	1-214	ALTERN CONTROL AMP No 3	6-216
'E' SCHEDULE IND LIGHT MODULE ENGINE 4	1-214	ALTERN CONTROL AMP No 4	8-216

Engine Control Schedule 'Mid' Circuit Diagram
Figure 103 (Sheet 1 of 2)

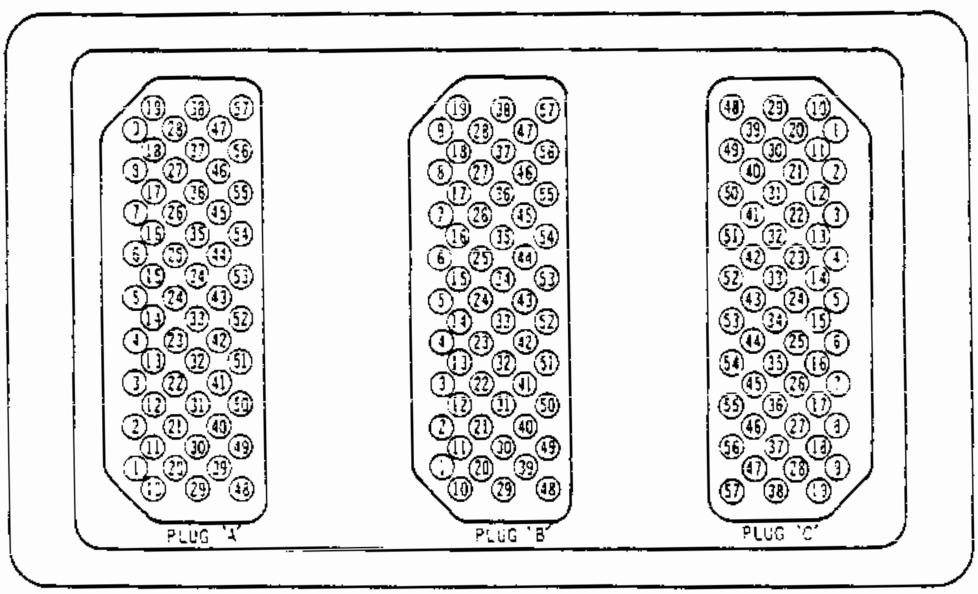


Engine Control Schedule 'Mid' Circuit Diagram
Figure 103 (Sheet 2 of 2)

CR 33135/00B



TEST SOCKET 1 (SOCKET 2 SIMILAR)



AMPLIFIER RACK CONNECTOR PINS

Engine Control Amplifier Test Socket and Rack Connector Pin Identification
Figure 104

R B 5. Electrical Checks

Ascertain from Table 102 the wiring diagram applicable to the engine and circuit to be checked.

CIRCUIT		WIRING DIAGRAM REFERENCE FOR ENGINE NO. 1	2	3	4
Power Supplies	(A	76-10-11	76-10-21	76-10-31	76-10-41
	(B	76-10-12	76-10-22	76-10-32	76-10-42
N_1 Probe) N_2 Probe) EGT and T1)		76-11-11	76-11-21	76-11-31	76-11-41
Actuator) Gearbox) (Throttle) Valve)) and PNC) Trim Unit)		76-13-11	76-13-21	76-13-31	76-13-41
Throttle) Control) Transmitter)		76-13-12	76-13-22	76-13-32	76-13-42

Engine Control Circuit Wiring Diagram
Table 102

Table 103 gives the checks that can be made at the main amplifier rack connector for each engine. Table 104 gives the checks that can be made similarly at the alternative amplifier rack connector. The pin identification for the checks is shown in Figure 104.

CIRCUIT	ITEM	EQUIP. IDENT.	RACK CONNECTOR PIN NO.	CHECK	TEST SOCKET/ PIN NO.
Power Supplies A	Circuit breaker	K1	C18	115 V a.c. supply	1/42
	Cable	K60			
	Cable	K126	C38	115 V earth	1/43
	Cable	K127	C37	Racking earth	-
	Cable	K128	B9	Screen earth	-
Power Supplies B	Circuit breaker	K3	A32	28 V d.c. supply	1/11
	Cable	K70			
	Throttle master s/w	K11		Contacts 2 to 1, MAIN selected	-
	Cable	K125	A9	28 V earth	-
N_1 Probe	Cable Cable	K107 K106	B34 B45	Continuity between pins B34 and B45	1/46 1/47
N_2 Probe	Cable Cable	K105 K104	B31 B42	Continuity between pins B31 and B42	1/45 1/44

Checks at Main Amplifier Rack Connector or
Test Socket Pins
Table 103 (Continued)

CIRCUIT	ITEM	EQUIP. IDENT.	RACK CONNECTOR PIN NO.	CHECK	TEST SOCKET/ PIN NO.
EGT Thermo-couple	Cable Cable	K98 K99	B11 B22	Continuity between pins B11 and B22	Chromel Alumel
T_1 Probe	Cable Cable Cable	K129 K102 K101	B17 B28 B36	Continuity between pins B17 and B36 and pins B28 and B36	1/38 1/40 1/41
Actuator Gearbox (Throttle Valve)	Cable Cable	K117 K109B	C51) C5)	Continuity between C51 and C5(motor control)	1/10 2/18
	Cable Cable	K118 K109C	C54) C5)	Continuity between C54 and C5 (motor reference)	1/6 2/18
	Cable Cable	K120 K121	C35) C46)	Continuity between C35 and C46 (VFB signal)	1/35 1/34
	Cable Cable	K123 K124	C32) C43)	Continuity between C32 and C43 (PVB signal)	1/24 1/25
	Cable Cable	K122 K111B	C48) C2)	Continuity between C48 and C2 (VFB and PFB ref-erence)	1/16 1/17
	Cable Cable	K119 K111C	C57) C2)	Continuity between C57 and C2 (brake)	1/9 1/7

Checks at Main Amplifier Rack Connector or
Test Socket Pins
Table 103 (Continued)

CIRCUIT	ITEM	EQUIP. IDENT.	RACK CONNECTOR PIN NO.	CHECK	TEST SOCKET/ PIN NO.
PNC Nozzle Trim Actuator	Cable Cable	K108 K109G	C13) C5)	Continuity between C13 and C5 (motor control)	1/6 2/18
	Cable Cable	K110 K109E	C16) C5)	Continuity between C16 and C5 (motor reference)	1/7 2/18
	Cable Cable	K112 K113	C29) C40)	Continuity between C29 and C40 (VFB signal)	1/37 1/36
	Cable Cable	K115 K116	C10) C21)	Continuity between C10 and C21 (PFB signal)	1/27 1/26
	Cable Cable	K114 K111E	C24) C2)	Continuity between C24 and C2 (VFB & PFB ref- erence)	1/19 1/17
	Cable Cable	K111G K109J	C2) C5)	Continuity between C2 and C5 (brake)	1/17 2/18

Checks at Main Amplifier Rack Connector or Test Socket Pins
Table 103 (Continued)

CIRCUIT	ITEM	EQUIP. IDENT.	RACK CONNECTOR PIN NO.	CHECK	TEST SOCKET/ PIN NO.
Pilots Throttle Lever Trans-mitter	Cable Cable	K84 K85	C31) C20)	Continuity between C31 and C20 (governor signal)	1/30 1/31
	Cable Cable	K88 K89	C45) C34)	Continuity between C45 and C34 (position signal)	1/28 1/29
	Cable Cable	K86 K87	C53) C55)	Continuity between C53 and C55 (reference)	1/17 1/20

Checks at Main Amplifier Rack Connector or
Test Socket Pins
Table 103 (Concluded)

CIRCUIT	ITEM	EQUIP. IDENT.	RACK CONNECTOR PIN NO.	CHECK	TEST SOCKET/ PIN NO.
Power Supplies A	Circuit breaker	K2	C18	115 V a.c. supply	1/42
	Cable	K139			
	Cable	K166	C38	115V earth	1/43
	Cable	K167	C37	Racking earth	
	Cable	K168	B9	Screen earth	
Power Supplies B	Cable breaker	K4	A32	28 V d.c.	1/11
	Cable	K142			
	Throttle master s/w	K11		Contacts 8 to 9, ALTN selected	
	Cable	K165	A9	28 V earth	
N_1 Probe	Cable Cable	K177 K178	B34 B45	Continuity between pins B34 and B45	1/46 1/46

Checks at Alternative Amplifier Rack Connector or
Test Socket Pins
Table 104 (Continued)

CIRCUIT	ITEM	EQUIP. IDENT.	RACK CONNECTOR PIN NO.	CHECK	TEST SOCKET/ PIN NO.
N_2 Probe	Cable Cable	K179 K180	B31 B42	Continuity between pins B31 and B42	1/45 1/44
EGT Thermo-couple	Cable Cable	K189 K188	B22 B11	Continuity between pins B22 and B21	Alumel Chromel
T_1 Probe	Cable Cable Cable	K181 K182 K183	B17 B28 B36	Continuity between pins B36 and B28 and pins B36 and B17	1/38 1/40 1/41

Checks at Alternative Amplifier Rack Connector or Test Socket Pins
Table 104 (Continued)

CIRCUIT	ITEM	EQUIP. IDENT.	RACK CONNECTOR PIN NO.	CHECK	TEST SOCKET/ PIN NO.
Actuator Gearbox (Throttle Valve)	Cable Cable	K161 K162B	C51) C5)	Continuity between C51 and C5 (motor control)	1/10
	Cable Cable	K163 K162C	C54) C5)	Continuity between C54 and C5 (motor reference)	1/6 2/18
	Cable Cable	K160 K159	C35) C46)	Continuity between C35 and C46 (VFB signal)	1/35 1/34
	Cable Cable	K156 K155	C32) C43)	Continuity between C33 and C43 (PFB signal)	1/24 1/25
	Cable Cable	K157 K158B	C48) C2)	Continuity between C48 and C2 (VFB & PFB signal)	1/16 1/17
	Cable Cable	K164 K158C	C57) C2)	Continuity between C57 and C2 (brake)	1/9 1/17

Checks at Alternative Amplifier Rack Connector or Test Socket Pins
Table 104 (Continued)

CIRCUIT	ITEM	EQUIP. IDENT.	RACK CONNECTOR PIN NO.	CHECK	TEST SOCKET/ PIN NO.
PNC Nozzle Trim Actuator	Cable Cable	K174 K162G	C13) C5)	Continuity between C13 and C5 (motor control)	1/6 2/18
	Cable Cable	K175 K162E	C16) C5)	Continuity between C16 and C5 (motor reference)	1/7 2/18
	Cable Cable	K173 K172	C29) C40)	Continuity between C29 and C40 (VFB signal)	1/37 1/36
	Cable Cable	K170 K169	C10) C21)	Continuity between C10 and C21 (PFB signal)	1/27 1/26
	Cable	K171 K158E	C24) C2)	Continuity between C24 and C2 (VFB & PFB reference)	1/19 1/17
	Cable Cable	K162J K158G	C5) C2)	Continuity between C5 and C2 (brake)	2/18 1/17

Checks at Alternative Amplifier Rack Connector or Test Socket Pins
Table 104 (Continued)

CIRCUIT	ITEM	EQUIP. IDENT.	RACK CONNECTOR PIN NO.	CHECK	TEST SOCKET/ PIN NO.
Pilots Throttle Lever Trans-mitter	Cable Cable	K149 K150	C31) C20)	Continuity between C31 and C20 (governor signal)	1/30 1/31
	Cable Cable	K153 K154	C45) C34)	Continuity between C45 and C34 (position signal)	1/28 1/29
	Cable Cable	K151 K152	C53) C55)	Continuity between C53 and C55 (reference)	1/17 1/20

Checks at Alternative Amplifier Rack Connector or
Test Socket Pins
Table 104 (Concluded)

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1					
(1) Circuit breaker 28 V	3-213	K35	-E SCHD SUP 2	-	76-11-72
(2) Circuit breaker 28 V	1-213	K34	-E SCHD SUP 1	-	76-11-71
(3) Circuit breaker 28 V	1-213	G292	-LH UC WEIGHT SW A SYS SUP	-	32-61-61
(4) Circuit breaker 28 V	3-213	G293	-LH UC WEIGHT SW B SYS SUP	-	32-61-62
(5) Circuit breaker 28 V	3-213	G294	-RH UC WEIGHT SW B SYS SUP	-	36-61-64
(6) Circuit breaker 28 V	1-213	G295	-RH UC WEIGHT SW A SYS SUP	-	32-61-63
(7) Circuit breaker 28 V	3-213	1K8	-RATING CONTROL))	-	76-11-51 76-15-61
(8) Circuit breaker 28 V	1-213	1K5	-MAIN THRUST FAIL))	-	76-10-11 76-11-61
(9) Circuit breaker 28 V	3-213	1K6	-ALTN THROT FAIL IND AJ MAX SUP	-	76-10-11
(10) Circuit breaker 28 V	3-213	K2300	-RATING IND SUP	-	76-11-55
(11) Circuit breaker 115 V	2-213	1K1	-MAIN THROT SUP	-	76-10-11
(12) Circuit breaker 115 V	14-215	1K2	-ALTN THROT SUP	-	76-10-11
(13) Circuit breaker 28 V	3-213	1K3	-MAIN THROT CONT	-	76-10-12

Component Identification
Table 105 (Continued)

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.1					
(14) Circuit breaker 28 V	15-216	1K4	=ALTN THROT CONT	-	76-10-12
(15) Engine control amplifier (Main)	8-215	1K20	-	76-11-11	76-10-11
(16) Engine control amplifier (Alternate)	6-215	1K21	-	76-11-11	76-10-11
(17) 'E' schedule indicator light module	1-214	K2336	-	76-10-00	76-11-81
(18) 'E' schedule control switch	1-214	K17	-	76-10-00	76-11-71 76-11-72
(19) NASU 1	10-215	K1123	-	76-10-00	78-30-31
(20) NASU 2	1-216	K1124	-	76-10-00	78-30-41
(21) LH UC downlock relay	2-123 2-123	G329 G328	- -	76-10-00	32-61-63 76-11-51 76-11-05
(22) RH UC downlock relay	3-123 3-123	G373 G372	- -	76-10-00	76-11-05 76-11-05
(23) Reheat control amplifier	6-243	1K1553	-	76-15-11	76-15-51
(24) Engine flight rating switch	4-211	1K33	-	76-10-00	76-11-51
(25) HP valve relay	19-123	1K133	-	73-00-00	73-21-11

Component Identification
Table 105 (Continued)

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(26) HP valve relay	19-123	1K134	-	73-00-00	73-21-11
(27) Engine rating mode switch	4-211	1K18	-	76-10-00	76-11-51
(28) Engine rating light module	2-211	K2301	-	76-10-00	76-11-55
(29) Air data computer ADC1	6-215	1F71	-	76-10-00	34-11-02 76-11-71
(30) Air data computer ADC2	6-216	2F71	-	76-10-00	76-11-72 34-11-07
(31) Reheat control switch	9-211	1K1547	-	76-10-00	76-15-51
(32) Throttle master switch	4-211	1K11	-	76-10-00	76-10-12
(33) Throttle failure caption	9-211	1K12	-	76-10-00	76-10-12
(34) Reverse select relay	19-123	1E463	-	76-10-00	77-13-11
(35) Terminal block	19-123	UM1871	-	76-10-00	76-10-11
(36) HP valve switch	4-211	1K132	-	-	73-21-11
(37) HP valve circuit breaker	3-213	1K131	-CI-HP VALVE CONT	-	73-21-11

Component Identification
Table 105 (Continued)

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
ENGINE NO.2					
(1) Circuit breaker 28 V	3-213	K35	-E SCHD SUP 2	-	76-11-72
(2) Circuit breaker 28 V	1-213	K34	-E SCHD SUP 1	-	76-11-71
(3) Circuit breaker 28 V	1-213	G292	-LH UC WEIGHT SW A SYS SUP	-	32-61-61
(4) Circuit breaker 28 V	3-213	G293	-LH UC WEIGHT SW B SYS SUP	-	32-61-62
(5) Circuit breaker 28 V	3-123	G294	-RH UC WEIGHT SW B SYS SUP	-	32-61-64
(6) Circuit breaker 28 V	1-213	G295	-RH UC WEIGHT SW A SYS SUP	-	32-61-63
(7) Circuit breaker 28 V	1-213	2K8	-RATING CONTROL	-	76-11-52 76-15-62
(8) Circuit breaker 28 V	3-213	2K5	-MAIN THROT FAIL	-	76-10-21 76-11-62
(9) Circuit breaker 28 V	1-213	2K6	-ALTN THROT FAIL IND AJ MAX SUP	-	76-10-21
(10) Circuit breaker 28 V	3-213	K2300	-RATING IND SUP	-	76-11-55
(11) Circuit breaker 115 V	2-213	2K1	-MAIN THROT SUP	-	76-10-21
(12) Circuit breaker 115 V	13-215	2K2	-ALTN THROT SUP	-	76-10-21
(13) Circuit breaker 28 V	1-213	2K3	-MAIN THROT CONT	-	76-10-22

Component Identification
Table 105 (Continued)

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(14) Circuit breaker 28 V	15-215	2K4	-ALTN THROT CONT	-	76-10-22
(15) Engine control amplifier (Main)	6-215	2K20	-	76-11-11	76-10-21
(16) Engine control amplifier) (Alternate)	8-215	2K21	-	76-11-11	76-10-21
(17) 'E' schedule indicator light module	1-214	K2336	-	76-10-00	76-11-81
(18) 'E' schedule control switch	1-214	K17	-	76-10-00	76-11-71 76-11-72
(19) NASU 1	10-215	K1123	-	76-10-00	78-30-31
(20) NASU 2	1-216	K1124	-	76-10-00	78-30-41
(21) LH UC downlock relay	2-123 2-123	G329 G328	- -	76-10-00	76-11-05 76-11-05
(22) RH UC downlock relay	3-123 3-123	G373 G372	- -	76-10-00	76-11-05 76-11-52 32-61-63
(23) Reheat control amplifier	4-243	2K1553	-	76-15-11	76-15-53
(24) Engine flight rating switch	4-211	2K33	-	76-10-00	76-11-52

Component Identification
Table 105 (Continued)

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(25) HP valve relay	19-123	2K133	-	73-00-00	73-21-12
(26) HP valve relay	19-123	2K134	-	73-00-00	73-21-12
(27) Engine rating mode switch	4-211	2K18	-	76-10-00	76-11-52
(28) Engine rating light module	2-211	K2301	-	76-10-00	76-11-55
(29) Air data computer ADC 1	6-215	1F71	-	76-10-00	34-11-02 76-11-71
(30) Air data computer ADC 2	6-216	2F71	-	76-10-00	34-11-07 76-11-72
(31) Reheat control switch	9-211	2K1547	-	76-10-00	76-15-53
(32) Throttle master switch	4-211	2K11	-	76-10-00	76-10-22
(33) Throttle failure caption	9-211	2K12	-	76-10-00	76-10-22
(34) Reverse select relay	19-123	2E463	-	76-10-00	77-13-21
(35) Terminal block	19-123	UM1873	-	76-10-00	76-10-21
(36) HP valve switch	4-211	2K132	-	-	73-21-12
(37) HP valve circuit breaker	1-213	2K131	-C3 - HP VALVE CONT	-	73-21-12

Component Identification
Table 105 (Continued)

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.3					
(1) Circuit breaker 28 V	3-213	K35	-E SCHD SUP 2	-	76-11-72
(2) Circuit breaker 28 V	1-213	K34	-E SCHD SUP 1	-	76-11-71
(3) Circuit breaker 28 V	1-213	G292	-LH UC WEIGHT SW A SYS SUP	-	32-61-61
(4) Circuit breaker 28 V	3-213	G293	-LH UC WEIGHT SW B SYS SUP	-	32-61-62
(5) Circuit breaker 28 V	3-213	G294	-RH UC WEIGHT SW B SYS SUP	-	32-61-64
(6) Circuit breaker 28 V	1-213	G295	-RH UC WEIGHT SW A SYS SUP	-	32-61-63
(7) Circuit breaker 28 V	1-213	3K8	-RATING CONTROL	-	76-11-53 76-15-63
(8) Circuit breaker 28 V	3-213	3K5	-MAIN THROT FAIL	-	76-10-31 76-11-62
(9) Circuit breaker 28 V	1-213	3K6	-ALTN THROT FAIL IND AJ MAX SUP	-	76-10-31
(10) Circuit breaker 28 V	3-213	K2300	-RATING IND SUP	-	76-11-55
(11) Circuit breaker 115 V	2-213	3K1	-MAIN THROT SUP	-	76-10-31
(12) Circuit breaker 115 V	13-216	3K2	-ALTN THROT SUP	-	76-10-31
(13) Circuit breaker 28 V	1-213	3K3	-MAINT THROT CONT	-	76-10-32

Component Identification
Table 105 (Continued)

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(14) Circuit breaker 28 V	15-215	3K4	-ALTN THROT CONT	-	76-10-32
(15) Engine control amplifier (Main)	8-216	3K20	-	71-11-11	76-10-31
(16) Engine control amplifier (Alternate)	6-216	3K21	-	76-11-11	76-10-31
(17) 'E' schedule indicator light module	1-214	K2336	-	76-10-00	76-11-81
(18) 'E' schedule control switch	1-214	K17	-	76-10-00	76-11-71 76-11-72
(19) NASU 1	10-215	K1123	-	76-10-00	78-30-31
(20) NASU 2	1-216	K1124	-	76-10-00	78-30-41
(21) LH UC downlock relay	2-123 2-123	G329 G328	- -	76-10-00	76-11-05 76-11-05
(22) RH UC downlock relay	3-123 3-123	G373 G372	- -	76-10-00	76-11-53 32-61-63 76-11-05
(23) Reheat control amplifier	4-244	3K1553	-	76-15-11	76-15-55
(24) Engine flight rating switch	4-211	3K33	-	76-10-00	76-11-53
(25) HP valve relay	20-123	3K133	-	73-00-00	73-21-53

Component Identification
Table 105 (Continued)

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(26) HP valve relay	20-123	3K134	-	73-00-00	73-21-13
(27) Engine rating mode switch	4-211	3K18	-	76-10-00	76-11-53
(28) Engine rating light module	2-211	K2301	-	76-10-00	76-11-55
(29) Air data computer ADC 1	6-215	1F71	-	76-10-00	34-11-02 76-11-71
(30) Air data computer ADC 2	6-216	2F71	-	76-10-00	34-11-07 76-11-72
(31) Reheat control switch	9-211	3K1547	-	76-10-00	76-15-51
(32) Throttle master switch	4-211	3K11	-	76-10-00	76-10-32
(33) Throttle failure caption	9-211	3K12	-	76-10-00	76-10-32
(34) Reverse select relay	20-123	3E463	-	76-10-00	77-13-31
(35) Terminal block	20-123	UM1872	-	76-10-00	76-10-31
(36) HP valve switch	4-211	3K132	-	-	73-21-13
(37) HP valve circuit breaker	1-213	3K131	-C4 - HP VALVE CONTROL	-	73-21-13

Component Identification
Table 105 (Continued)

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO.4					
(1) Circuit breaker 28 V	3-213	K35	-E SCHD SUP 2	-	76-11-72
(2) Circuit breaker 28 V	1-213	K34	-E SCHD SUP 1	-	76-11-71
(3) Circuit breaker 28 V	1-213	G292	-LH UC WEIGHT SW A SYS SUP	-	32-61-61
(4) Circuit breaker 28 V	3-213	G293	-LH UC WEIGHT SW B SYS SUP	-	36-61-62
(5) Circuit breaker 28 V	3-213	G294	-RH UC WEIGHT SW B SYS SUP	-	32-61-64
(6) Circuit breaker 28 V	1-213	G295	-RH UC WEIGHT SW A SYS SUP	-	32-61-63
(7) Circuit breaker 28 V	3-213	4K8	-RATING CONTROL	-	76-11-54 76-15-64
(8) Circuit breaker 28 V	1-213	4K5	-MAIN THROT FAIL	-	76-10-41 76-11-61
(9) Circuit breaker 28 V	3-213	4K6	-ALTN THROT FAIL IND AJ MAX SUP	-	76-10-41
(10) Circuit breaker 28 V	3-213	K2300	-RATING IND SUP	-	76-11-55
(11) Circuit breaker 115V	2-213	4K1	-MAIN THROT SUP	-	76-10-41
(12) Circuit breaker 115 V	14-216	4K2	-ALTN THROT SUP	-	76-10-41
(13) Circuit breaker 28 V	3-213	4K3	-MAIN THROT CONT	-	76-10-42

Component Identification
Table 105 (Continued)

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(14) Circuit breaker 28 V	15-216	4K4	-ALTN THROT CONT	-	76-10-42
(15) Engine control amplifier (Main)	6-216	4K20	-	76-11-11	76-10-41
(16) Engine control amplifier (Alternate)	8-216	4K21	-	76-11-11	76=10-41
(17) 'E' schedule indicator light module	1-214	K2336	-	76-10-00	76-11-81
(18) 'E' schedule control switch	1-214	K17	-	76-10-00	76-11-72
(19) NASU 1	10-215	K1123	-	76-10-00	78-30-31
(20) NASU 2	1-216	K1124	-	76-10-00	78-30-41
(21) LH UC downlock relay	2-123 2-123	G329 G328	- -	76-10-00	76-11-05 76-11-54 32-61-62
(22) RH UC downlock relay	3-123 3-123	G373 G372	- -	76-10-00	76-11-05 76-11-05
(23) Reheat control amplifier	6-244	4K1553	-	76-15-11	76-15-57
(24) Engine flight rating switch	4-211	4K33	-	76-10-00	76-11=54

Component Identification
Table 105 (Continued)

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(25) HP valve relay	20-123	4K133	-	73-00-00	73-21-14
(26) HP valve relay	20-123	1K134	-	73-00-00	73-21-14
(27) Engine rating mode switch	4-211	4K18	-	76-10-00	76-11-54
(28) Engine rating light module	2-211	K2301	-	76-10-00	76-11-55
(29) Air data computer ADC 1	6-215	1F71	-	76-10-00	34-11-02 76-11-71
(30) Air data computer ADC 2	6-216	2F71	-	76-10-00	34-11-07
(31) Reheat control switch	9-211	4K1547	-	76-10-00	76-15-57
(32) Throttle master switch	4-211	4K11	-	76-10-00	76-10-42
(33) Throttle failure caption	9-211	4K12	-	76-10-00	76-10-42
(34) Reverse select relay	20-123	4E463	-	76-10-00	77-13-41

Component Identification
Table 105 (Continued)

ITEM NO. AND DESCRIPTION	PANEL/ ZONE	EQUIP. IDENT.	MAP REF.	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(35) Terminal block	20-123	UM1874	-	76-10-00	76-10-41
(36) HP valve switch	4-211	4K132	-	-	73-21-14
(37) HP valve circuit breaker	3-213	4K131	-C2 - HP VALVE CONTROL	-	73-21-14

Component Identification
Table 105 (Concluded)

END OF THIS
SECTION

NEXT

REHEAT SYSTEM - TROUBLE SHOOTING

1. General

Faults occurring during flights are generally associated with illumination of warning captions located on the flight deck.

Visual observation of these captions associated with nozzle area monitoring (AJ Indicators) enable trouble shooting methods to be initiated for the various reheat sub-assemblies.

To facilitate interpretation of these four indicators located on panel 6-211, the dials have white sectors for the AJ areas reheat. Furthermore, for engine No.4, there is a yellow sector which takes into account engine 4 60 knot limitation during the initial take-off phase.. The different combinations of warning captions and AJ indications are given on Table 101 (Sheet 1 and 2).

When a combination of captions GREEN-GO-LIGHT-CON LIGHT located on panel 6-211 and REHEAT failure caption located on panel 1-214 has been selected on Table 101 Sheet 1, and 2 reference to the associated remarks of Table 101, sheet 3 or 4 will indicate the reheat sub-system to be suspected and also the trouble-shooting chart to refer to start investigation allowing isolation of defect. The combination of captions shown on Table 101 have been sequenced into three main phases related to reheat operation:

During reheat operation, from the time reheat is selected to reheat shut down order.

During reheat shut down, from the time of reheat shut down order to the end of sequence T3.
(T3 = 15 seconds after reheat shut down order)

After reheat shut down, when sequence T3 is finished.

Some defects being associated with automatic shut down of the reheat, reference has also been made to the indication given by the FT flag of the fuel flow rate indicator located on panel 6-211.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref.Table 103). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

Instructions for use of the Reheat Test Set and Reheat Test Box are given in chapter 76-15-00.

All procedures dealing with troubleshooting are based on the assumption that electrical wiring is serviceable, and that electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 103).

R B NOTE: In case of reheat failure to light at the first selection
R B during take-off, the following procedure has been laid
R B down before troubleshooting.

R B It is important that when a re-selection or failure to
R B light is reported engineering action MUST BE TAKEN before
R B the situation deteriorates into an abandoned take-off.

R B A failure of reheat to light can only be caused by two
R B systems:

R B -Ignition or Fuel flow

R B - From Tech. Log information and attached chart
R B 'Reheat Associated Indications' identify 'suspect
R B components'. This will simplify troubleshooting
R B by immediately highlighting the probable cause.

R B Remark: If insufficient information available
R B OBTAIN AIDS PRINTOUT of take-off involved.
R B A CONC E1 Multipass gives enough information
R B to identify whether an ignition or fuel flow
R B problem exits.

R B - When suspect components are identified, troubleshoot
R B as necessary using Charts 101-112.

WARNING CAPTION		ENGINE PARAMETERS		AUTOMATIC SHUT-DOWN	COMPONENTS SUSPECTED
CON	REHEAT	AJ BAND	FT FLAG IN VIEW		
OFF	OFF	DRY	NO	YES	- N1 SIGNAL (PROBE-WIRING) - RHT AMPLIFIER
OFF	ON*	DRY	NO	YES	- METERING VALVE (RFCU) - RHT AMPLIFIER
ON	OFF	DRY	YES	NO	- IGNITER - TRANSFORMER - RHT AMPLIFIER
ON	OFF	DRY	NO	YES	- 115V/400HZ RHT AMPLI - SUPPLY
ON	ON	DRY	NO	YES	- SHUT OFF VALVE SOLENOID SUPPLY - REHEAT FUEL CONTROL UNIT - RHT AMPLI
ON	ON*	DRY	NO	YES	- REHEAT IGNITION CONTROL RELAY - FR SIGNAL (FLOWMETER - WIRING) - METERING VALVE (RFCU) - SHUT OFF VALVE (RFCU)
ON	ON*	DRY	YES	NO	- REHEAT IGNITION SAFETY RELAY - RHT AMPLI

R B

* LATCH CAPTION - (WILL EXTINGUISH AFTER TRIPPING AND RESETTING THE CIRCUIT BREAKERS)

R B Reheat Associated Indications

	REHEAT SHUT DOWN ORDER						
	DURING REHEAT OPERATION	DURING REHEAT SHUT-DOWN (T3 = 15 Sec)	AFTER REHEAT SHUT DOWN (T3 ELAPSED)	AJ BAND	FT FLAG SHOWING UP	AUTOMATIC SHUT-DOWN	
1	* CON REHEAT	CON REHEAT	CON REHEAT	REHEAT	*		1
2	* CON REHEAT	CON REHEAT	CON REHEAT	REHEAT	*		2
3	* CON REHEAT	CON REHEAT	CON REHEAT	DRY		*	3
4	* CON REHEAT	CON REHEAT	CON REHEAT	REHEAT	*		4
5	* CON REHEAT	CON REHEAT	CON REHEAT	DRY	*		5
6	* CON REHEAT	CON REHEAT	CON REHEAT	DRY		*	6
7	* CON REHEAT	CON REHEAT	CON REHEAT	DRY		*	7
8	* CON REHEAT	CON REHEAT	CON REHEAT **	DRY		*	8
9	* CON REHEAT	CON REHEAT	CON REHEAT **	DRY		*	9
10	* CON REHEAT	CON REHEAT	CON REHEAT **	DRY	*		10

CONTINUED ON SHEET 3

CONTINUED ON SHEET 2

* LIGHTS UP DURING TAKE-OFF ONLY.

** LATCH CAPTION - WILL EXTINGUISH AFTER TRIPPING AND RESETTING THE 115V/400 HZ AND 28 V.DC REHEAT AMPLIFIER SUPPLY CIRCUIT BREAKERS.

Reheat Associated Warning Captions and Remarks
Table 101 (Sheet 1 of 4)
Figure 101

REHEAT SHUT DOWN ORDER

CONTINUED FROM SHEET 1

	DURING REHEAT OPERATION	DURING REHEAT SHUT DOWN (T3 = 15 Sec)	AFTER REHEAT SHUT DOWN (T3 ELAPSED)	AJ BAND	FT FLAG SHOWING UP	AUTOMATIC SHUT-DOWN	
11	* CON REHEAT	CON REHEAT	CON REHEAT * *	DRY		*	11
12	* CON REHEAT	CON REHEAT	CON REHEAT * *	REHEAT	*		12
13	* CON REHEAT	CON REHEAT	CON REHEAT * *	REHEAT	*		13
14	* CON REHEAT	CON REHEAT	CON REHEAT	REHEAT	*		14
15	* CON REHEAT	CON REHEAT	CON REHEAT	REHEAT	*		15
16	* CON REHEAT	CON REHEAT	CON REHEAT	REHEAT	*		16
17	* CON REHEAT	CON REHEAT	CON REHEAT	LOW	*		17
18	* CON REHEAT	CON REHEAT	CON REHEAT	FLUCTUATE	*		18
19	* CON REHEAT	CON REHEAT	CON REHEAT	DRY			19

CONTINUED ON SHEET 4

* LIGHTS UP DURING TAKE-OFF ONLY.

* * LATCH CAPTION - WILL EXTINGUISH AFTER TRIPPING AND RESETTING THE 115V/400 HZ AND 28 V.DC REHEAT AMPLIFIER SUPPLY CIRCUIT BREAKERS.

Reheat Associated Warning Captions and Remarks
Table 101 (Sheet 2 of 4)
Figure 101

CONTINUED FROM SHEET 1

	REMARKS	TROUBLE SHOOTING CHART No.
1	ALL PARAMETERS : P7 - FT - SECONDARY NOZZLE POSITION. SATISFACTORY AND REHEAT SELECTED AND LIT.	
2	ONE OR MORE OF THE FOLLOWING PARAMETERS DEFICIENT - P7 - FT - SECONDARY NOZZLE POSITION - REHEAT O.K.	
3	REHEAT DOES NOT LIGHT UP FOLLOWING MINIMUM N1 (81%) BEING ACHIEVED OR AUTOMATIC SHUT DOWN FOLLOWING SATISFACTORY LIGHT UP.	101
4	REHEAT LIGHTS UP AND OPERATES NORMALLY - SUSPECT REHEAT DETECTION SYSTEM (LACK OF DETECTION).	102
5	REHEAT DOES NOT LIGHT UP - REHEAT FUEL FLOW CORRECT - NO AUTOMATIC SHUT DOWN. SUSPECT REHEAT IGNITION SYSTEM (LACK OF SPARK).	103
6	REHEAT DOES NOT LIGHT UP OR IS SHUT DOWN AUTOMATICALLY. NO REHEAT FUEL FLOW - AUTOMATIC SHUT DOWN - SUSPECT 115V/400HZ REHEAT CONTROL AMPLIFIER SUPPLY (LOST OR TEMPORARILY LOST FOR A TIME GREATER THAN 1.25 SEC.).	103
7	REHEAT DOES NOT LIGHT UP OR IS SHUT DOWN AUTOMATICALLY. NO REHEAT FUEL FLOW - AUTOMATIC SHUT DOWN - SUSPECT A SHORT CIRCUIT ON THE SHUT-OFF VALVE SOLENOID.	104
8	REHEAT DOES NOT LIGHT UP OR IS SHUT DOWN AUTOMATICALLY. NO REHEAT FUEL FLOW - AUTOMATIC SHUT DOWN - SUSPECT A SHORT CIRCUIT ON THE REHEAT IGNITION CONTROL RELAY.	105
9	REHEAT DOES NOT LIGHT UP OR IS SHUT DOWN AUTOMATICALLY. NO REHEAT FUEL FLOW - AUTOMATIC SHUT DOWN - SUSPECT A DIRECT LOSS OF THE FR SIGNAL OR INDIRECTLY LOSS OF THE REHEAT FUEL FLOW THROUGH A METERING OR SHUT-OFF VALVE CLOSED.	105
10	REHEAT DOES NOT LIGHT UP - REHEAT FUEL FLOW CORRECT - NO AUTOMATIC SHUT DOWN - SUSPECT A SHORT CIRCUIT ON THE REHEAT IGNITION SAFETY RELAY.	106

CMS 71 00 49 1 AACC

Reheat Associated Warning Captions and Remarks
Table 101 (Sheet 3 of 4)
Figure

	REMARKS	TROUBLE SHOOTING CHART No.
11	REHEAT DOES NOT LIGHT UP OR IS SHUT DOWN AUTOMATICALLY. NO REHEAT FUEL FLOW - AUTOMATIC SHUT DOWN - SUSPECT A SHORT CIRCUIT ON THE METERING VALVE CONTROL MOTOR.	107
12	REHEAT LIGHTS UP AND OPERATES NORMALLY - REHEAT FUEL FLOW CORRECT - NO AUTOMATIC SHUT DOWN - SUSPECT MALFUNCTION OF THE REHEAT DETECTION SYSTEM (FALSE DETECTION).	108
13	REHEAT LIGHTS UP AND OPERATES NORMALLY. REHEAT FUEL FLOW CORRECT - NO AUTOMATIC SHUT DOWN. SUSPECT THE REHEAT IGNITION CONTROL RELAY TO BE STILL ENERGIZED OR STUCK AFTER T7 SEQUENCE.	109
14	REHEAT LIGHTS UP AND OPERATES NORMALLY - REHEAT FUEL FLOW CORRECT - NO AUTOMATIC SHUT DOWN - SUSPECT A PURGE VALVE OPEN OR SENSED AS SUCH WHEN REHEAT IS SHUT DOWN. DEFECT DISAPPEARS WHEN REHEAT IS FUNCTIONING.	109
15	REHEAT LIGHTS UP AND OPERATES NORMALLY. REHEAT FUEL FLOW CORRECT - NO AUTOMATIC SHUT DOWN - SUSPECT A SHORT CIRCUIT ON THE PURGE VALVE SOLENOID.	110
16	REHEAT OPERATES BUT REACHES TOO HIGH A RATIO - SUSPECT LOSS OF T1 SIGNAL (IF TAKE OFF RATING IS SELECTED) OR ERRONEOUS FR OR FE SIGNAL.	111
17	REHEAT DOES NOT LIGHT UP, OR OPERATES AT LOW AJ VALUE AND MAY EXTINGUISH IF POWER SETTING IS INCREASED (CON CAPTION WILL FLASH OR ILLUMINATE IN SYMPATHY). FUEL FLOW INDICATION LOW - SUSPECT LOSS OF THE FE SIGNAL.	111
18	REHEAT OPERATES BUT IS LIMITED TO AN INTERMEDIATE RATIO OR FLUCTUATES (CON CAPTION MAY ILLUMINATE OR FLASH). SUSPECT LOSS OF T1 SIGNAL (FLIGHT RATING SELECTED) OR ERRONEOUS FR OR FE SIGNAL. ALSO POSSIBLE DEFECT OF THE REHEAT METERING VALVE MOTOR.	111
19	REHEAT IS NOT INITIATED - SUSPECT LOSS OF COMMAND SIGNAL.	112

CONTINUED FROM SHEET 2

CMS 71 00 49 1 AACD

Reheat Associated Warning Captions and Remarks
Table 101 (Sheet 4 of 4)
Figure

2. Trouble Shooting

A. Refer to Table 101 and select the combination of captions most representative of the Aircrew report. Using the associated remarks select the trouble shooting chart to follow.

B. Aircrew reports can vary on detail and are not always consistent. This can cause incorrect maintenance actions and increase the risk of a rejected take-off. To assist in locating the correct trouble shooting chart, you need to know:

If fuel flow increased above dry engine value (FT obtained - reheat not lit).

If reheat fuel flow did not increase (No reheat fuel flow, reheat did not light).

If reheat fuel flow obtained but scheduled to a low value (Reheat lit but low fuel flow).

The Airbourne Integrated Data System (A.I.D.S.) data analysis can confirm any of the above conditions (Ref. Table 103).

If the crew report contains more detailed information, refer to Table 101 for the relevant trouble shooting chart.

Low reheat fuel flow can be caused by the engine control amplifier lane not in use - Relay 25. This type of defect shows as an intermittent high contact resistance (Ref. T1 System Checks Chart 111 Sheet 3).

C. Ensure that reheat system circuit breakers listed in Table 102 are set.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine NO. 1			
REHEAT CON	15-216	1K 1542	E 9
REHEAT AMP SUP	14-215	1K 1541	C12
REHEAT IGN SUP PH C	14-215	1K 1544	F12
REHEAT IGN SUP PH A	14-215	1K 1543	B13

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine NO. 2			
REHEAT CON	15-215	2K 1542	D15
REHEAT AMP SUP	13-215	2K 1541	B14
REHEAT IGN SUP PH C	13-215	2K 1544	E14
REHEAT IGN SUP PH A	13-215	2K 1543	A14
Engine NO. 3			
REHEAT CON	15-215	3K 1542	D16
REHEAT AMP SUP	13-216	3K 1541	B 7
REHEAT IGN SUP PH C	13-216	3K 1544	F 6
REHEAT IGN SUP PH A	13-216	3K 1543	A 5
Engine NO. 4			
REHEAT CON	15-216	4K 1542	E10
REHEAT AMP SUP	14-216	4K 1541	D 7
REHEAT IGN SUP PH C	14-216	4K 1544	E 7
REHEAT IGN SUP PH A	14-216	4K 1543	A 6

Circuit Breakers
Table 102

R D. Ensure that external power supply is connected.

R E. Switch on electrical ground power (Ref. 24-41-00).

<u>WARNING:</u> THE REHEAT FLAME DETECTOR (IONISATION) IS ENERGIZED UNDER 150V AS LONG AS THE REHEAT CIRCUITS REMAIN ELECTRICALLY SUPPLIED FOR FAULT ISOLATION PURPOSES. FURTHERMORE, THE REHEAT IGNITION HIGH ENERGY VOLTAGE IS POTENTIALLY LETHAL. COMPLY WITH THE SAFETY PRECAUTION DETAILED IN CHAPTER 12. BEFORE CARRYING OUT ANY VISUAL INSPECTION OF AREAS INSIDE THE REHEAT CHAMBER WHICH REQUIRES THE OPERATOR TO COME CLOSE TO THE BUCKETS, MAKE SURE THAT NO SOURCE OF COMPRESSED AIR IS CONNECTED TO THE GROUND AIR CONNECTORS OF THE TWIN SECONDARY NOZZLE.

REHEAT SYSTEM SYMPTON	TROUBLE SHOOTING CHART NO.
1. REHEAT FAIL TO LIGHT - FT NORMAL NO IGNITION	103 AND 106
2. REHEAT FAIL TO LIGHT - NO FT INCREASE NO REHEAT FUEL FLOW	103, 104 AND 105
3. REHEAT LIT BUT LOW REHEAT FUEL FLOW	111

List of Trouble Shooting Charts
Table 103

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DURING REHEAT OPERATION	DURING REHEAT SHUT DOWN (T3 = 15 sec)	AFTER REHEAT SHUT DOWN - T3 ELAPSED -
CON REHEAT	CON REHEAT	CON REHEAT

REHEAT DOES NOT LIGHT UP OR IS SHUT DOWN AUTOMATICALLY.
AUTOMATIC SHUT DOWN NO CAPTIONS ILLUMINATING.

NOTE : BEFORE ENTERING THIS CHART MAKE SURE THAT ENGINE PARAMETERS WERE SATISFACTORY AT TIME OF DEFECT, SPECIALLY ENGINE N1 R.P.M.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART No.
POWER SUPPLY 28 VDC 115V, 400 HZ	
REHEAT TEST SET OR	9970-531-034
REHEAT TEST BOX	9970-531-044
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-
REHEAT AMPLIFIER DPX EXTENSION	9970-531-040

CHECK GROUND EQUIPMENT AVAILABLE IS REHEAT TEST SET 9970-531-034 AVAILABLE ?

NO → USE REHEAT TEST BOX 9970-531-044 → REFER TO CHART 101 SHEET 2

YES ↓

CONNECT REHEAT TEST SET. POWER SUPPLY 28 VDC - 115V/400 Hz
CARRY OUT AUTOMATIC CYCLE AND CHECK THAT THE CAPTION AUTOM-STOP REMAINS EXTINGUISHED ON THE REHEAT TEST SET

NO → CHANGE REHEAT CONTROL AMPLIFIER (9).

YES ↓

REMOVE REHEAT CONTROL AMPLIFIER (9) AND INSTALL REHEAT AMPLIFIER DPX EXTENSION. CHECK LP COMPRESSOR PROBE COIL CIRCUIT FOR INSULATION AND CONTINUITY (PINS 32B-34B - EARTH 15B). SATISFACTORY ?

YES ↓ TROUBLE SHOOT FOLLOWING CHART 112.

NO → DISCONNECT WIRING FROM LP COMPRESSOR PROBE COIL AND CHECK IT FOR INSULATION AND CONTINUITY. SATISFACTORY?

NO ↓ CHANGE LP COMPRESSOR PROBE (18)

YES ↓ LOCATE AND RECTIFY DEFECT ON WIRING

CMS 71 00 49 1 AAMA

Chart 101 (Sheet 1 of 2)

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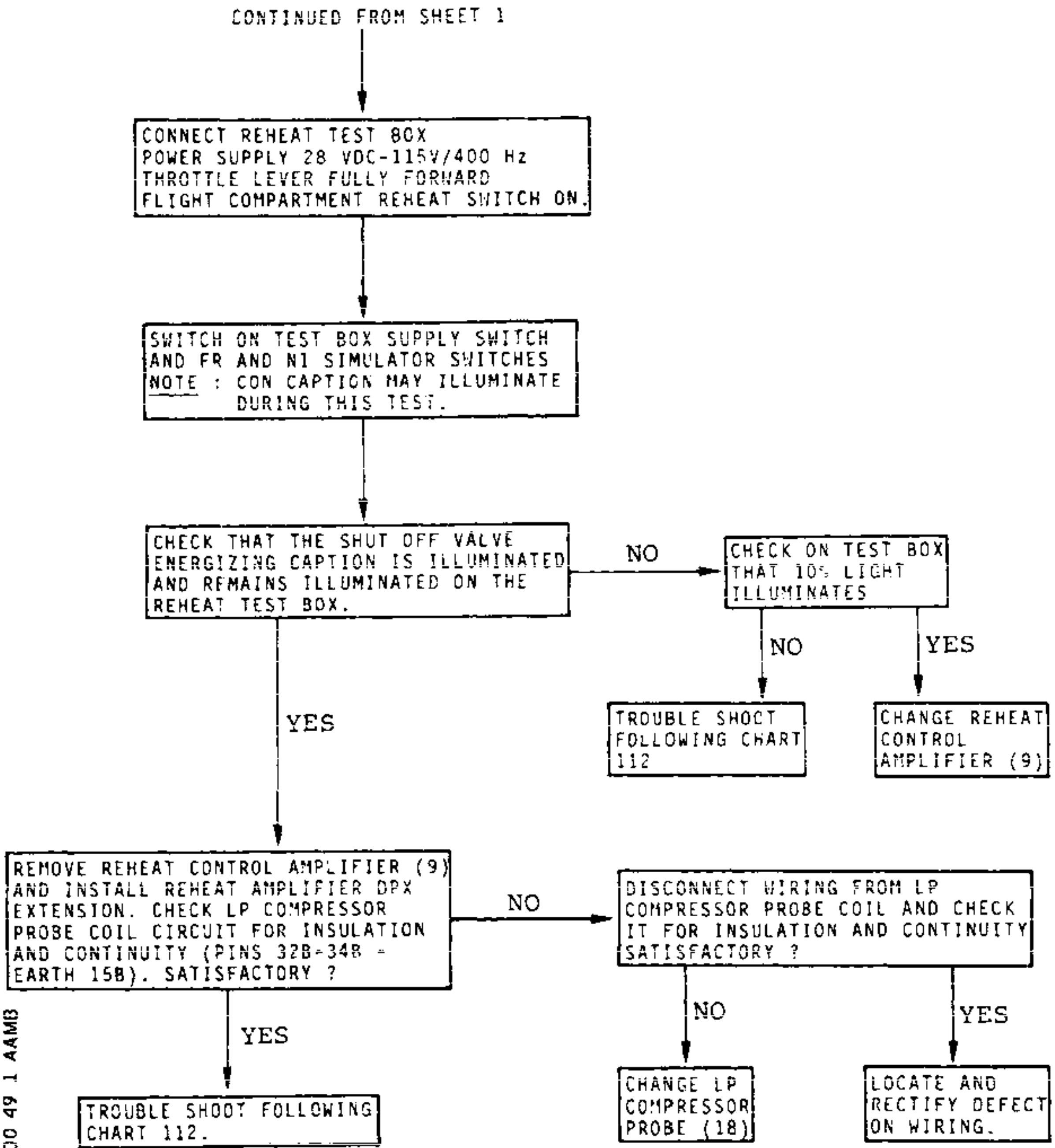
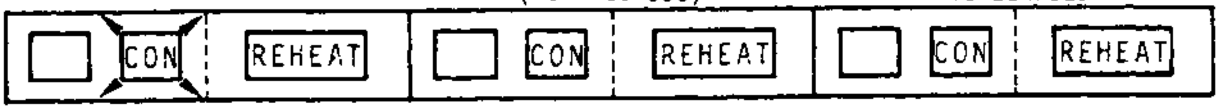


CMS 71 00 49 1 AAMB

Chart 101 (Sheet 2 of 2)

DURING REHEAT OPERATION | DURING REHEAT SHUT DOWN (T3 = 15 sec) | AFTER REHEAT SHUT DOWN T3 ELAPSED -



REHEAT LIGHTS UP AND AND OPERATES NORMALLY. CON CAPTION ILLUMINATES UP TO REHEAT SHUT DOWN ORDER.

NOTE : TRIPPING AND RESETTING THE 28 VDC - 115V/400HZ REHEAT CONTROL AMPLIFIER SUPPLY CIRCUIT BREAKERS WILL EXTINGUISH REHEAT CAPTION.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART No.
POWER SUPPLY 28 VDC 115V, 400 Hz	
REHEAT TEST SET	9970-531-034
OR	
REHEAT TEST BOX	9970-531-044
PRESSURE SWITCH TEST SET	9970-531-033
REHEAT FLAME SIMULATOR	9970-531-042
MULTIMETER	
CIRCUIT BREAKER SAFETY CLIPS	
REHEAT AMPLIFIER DPX EXTENSION.	9970-531-040

CHECK GROUND EQUIPMENT AVAILABLE IS REHEAT TEST SET 9970-531-034 AVAILABLE ?

NO → USE REHEAT TEST BOX 9970-531-044 → REFER TO CHART 102 SHEET 3

YES ↓

CONNECT REHEAT TEST SET. POWER SUPPLY 28 VDC - 115V/400 HZ. CARRY OUT AUTOMATIC CYCLE. POSITION REHEAT TEST SET "SIMULATED FLAME DETECTOR" SWITCH ON AND CHECK THAT "FLAME DETECTION" CAPTION GOES ON.

NO → CHANGE REHEAT CONTROL AMPLIFIER (9)

YES ↓

POSITION TEST SET "SIMULATED FLAME DETECTOR" SWITCH OFF. INSTALL REHEAT FLAME SIMULATOR LEADS BETWEEN REHEAT FLAME HOLDER AND REHEAT DETECTOR (23).
WARNING : CHECK THAT POWER SUPPLY IS OFF BEFORE ENTERING REHEAT JET PIPE.
POSITION REHEAT TEST SET ROTARY SWITCH TO "MAN" - NL SWITCH TO OFF. THROTTLE LEVER FULLY FORWARD-FLIGHT COMPARTMENT REHEAT SWITCH ON. CHECK THAT "FLAME DETECTION" LIGHT GOES ON.

NO → CUT OFF POWER SUPPLY 28 V.DC - 115V/400 Hz. DISCONNECT REHEAT DETECTOR (23) AND INSTALL A LINK ACCROSS PINS A AND B OF THE CONNECTOR.

↓

REMOVE REHEAT CONTROL AMPLIFIER (9) AND INSTALL REHEAT AMPLIFIER DPX EXTENSION. CHECK FOR INSULATION AND CONTINUITY OF THE REHEAT DETECTOR CIRCUIT (PINS 33B-15B). SATISFACTORY ?

YES → CHANGE REHEAT DETECTOR (23).

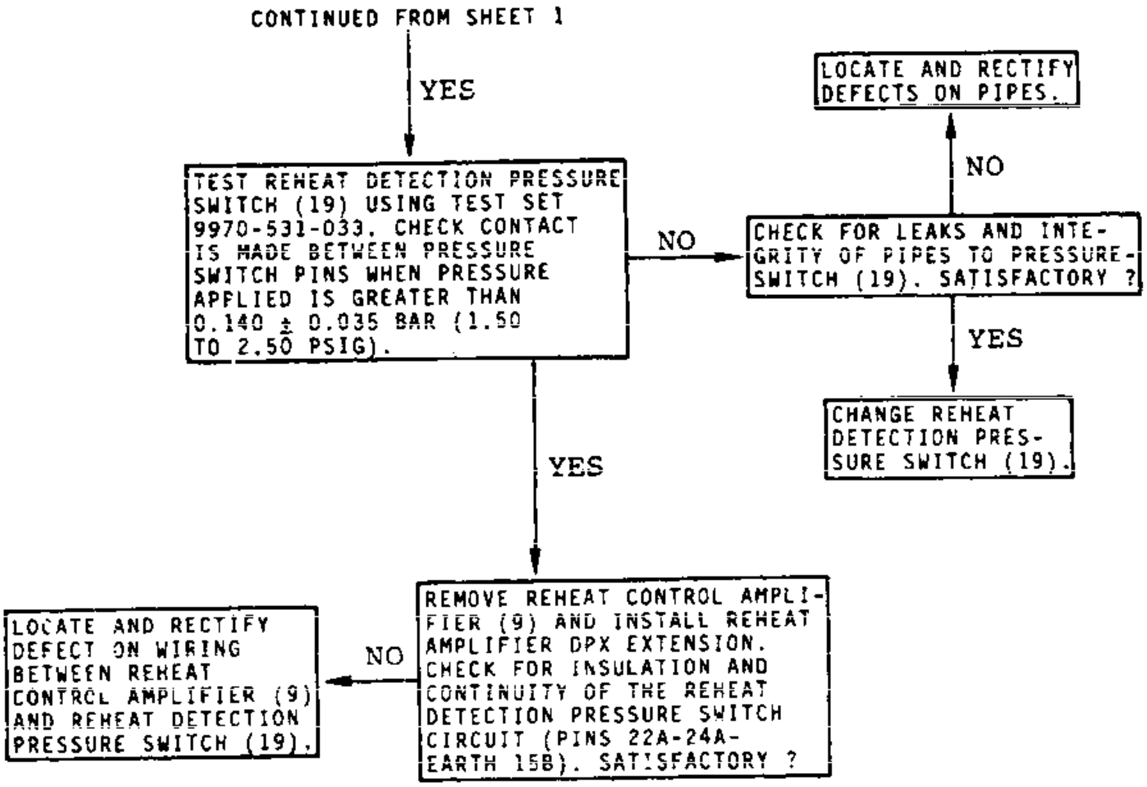
NO → LOCATE AND RECTIFY DEFECT ON THE WIRING BETWEEN REHEAT CONTROL AMPLIFIER (9) AND REHEAT DETECTOR (23).

YES ↓

CONTINUED ON SHEET 2

CMS 71 00 49 1 BAMA

Chart 102 (Sheet 1 of 3)



CMS 71 00 49 1 BAMB

R Chart 102 (Sheet 2 of 3)

CONTINUED FROM SHEET 1

ENSURE THAT POWER SUPPLY 28 VDC-115V/400HZ IS OFF. INSTALL REHEAT FLAME SIMULATOR LEADS BETWEEN REHEAT FLAME HOLDER AND REHEAT DETECTOR (23). WARNING : CHECK THAT POWER SUPPLY IS OFF BEFORE ENTERING REHEAT CHAMBER.

CONNECT REHEAT TEST BOX. POWER SUPPLY 28 VDC-115V/400HZ. THROTTLE LEVER FULLY FORWARD. FLIGHT COMPARTMENT REHEAT SWITCH ON.

SWITCH ON TEST BOX SUPPLY SWITCH AND FR AND N1 SIMULATION SWITCHES. CHECK THAT CON CAPTION REMAINS EXTINGUISHED ON THE FLIGHT DECK STATION.

YES

TEST REHEAT DETECTION PRESSURE SWITCH (19) USING TEST SET 9970-531-033. CHECK CONTACT IS MADE BETWEEN PRESSURE SWITCH PINS WHEN PRESSURE APPLIED IS GREATER THAN 0.140 ± 0.035 BAR (1.50 TO 2.50 PSIG).

YES

REMOVE REHEAT CONTROL AMPLIFIER (9) AND INSTALL REHEAT AMPLIFIER DPX EXTENSION. CHECK FOR INSULATION AND CONTINUITY OF THE REHEAT DETECTION PRESSURE SWITCH CIRCUIT (PINS 22A-24A-EARTH 15B). SATISFACTORY ?

NO

LOCATE AND RECTIFY DEFECT ON WIRING BETWEEN REHEAT CONTROL AMPLIFIER (9) AND REHEAT DETECTION PRESSURE SWITCH (19).

NO

CHECK FOR LEAKS AND INTEGRITY OF PIPES TO PRESSURE SWITCH (19). SATISFACTORY ?

NO

LOCATE AND RECTIFY DEFECTS ON PIPES .

YES

CHANGE REHEAT DETECTION PRESSURE SWITCH (19).

NO

CUT OFF POWER SUPPLY 28 V.DC - 115V/400 Hz. DISCONNECT REHEAT DETECTOR (23) AND INSTALL A LINK ACROSS PINS A AND B OF THE CONNECTOR.

REMOVE REHEAT CONTROL AMPLIFIER (9) AND INSTALL REHEAT AMPLIFIER DPX EXTENSION. CHECK FOR INSULATION AND CONTINUITY OF THE REHEAT DETECTOR CIRCUIT.(PINS 33B-15B). SATISFACTORY ?

NO

LOCATE AND RECTIFY DEFECT ON THE WIRING BETWEEN REHEAT CONTROL AMPLIFIER (9) AND REHEAT DETECTOR (23).

YES

CHANGE REHEAT DETECTOR (23). FAULT CLEARED ?

NO

CHANGE REHEAT CONTROL AMPLIFIER (9).

CMS 71 00 49 1 BAMC

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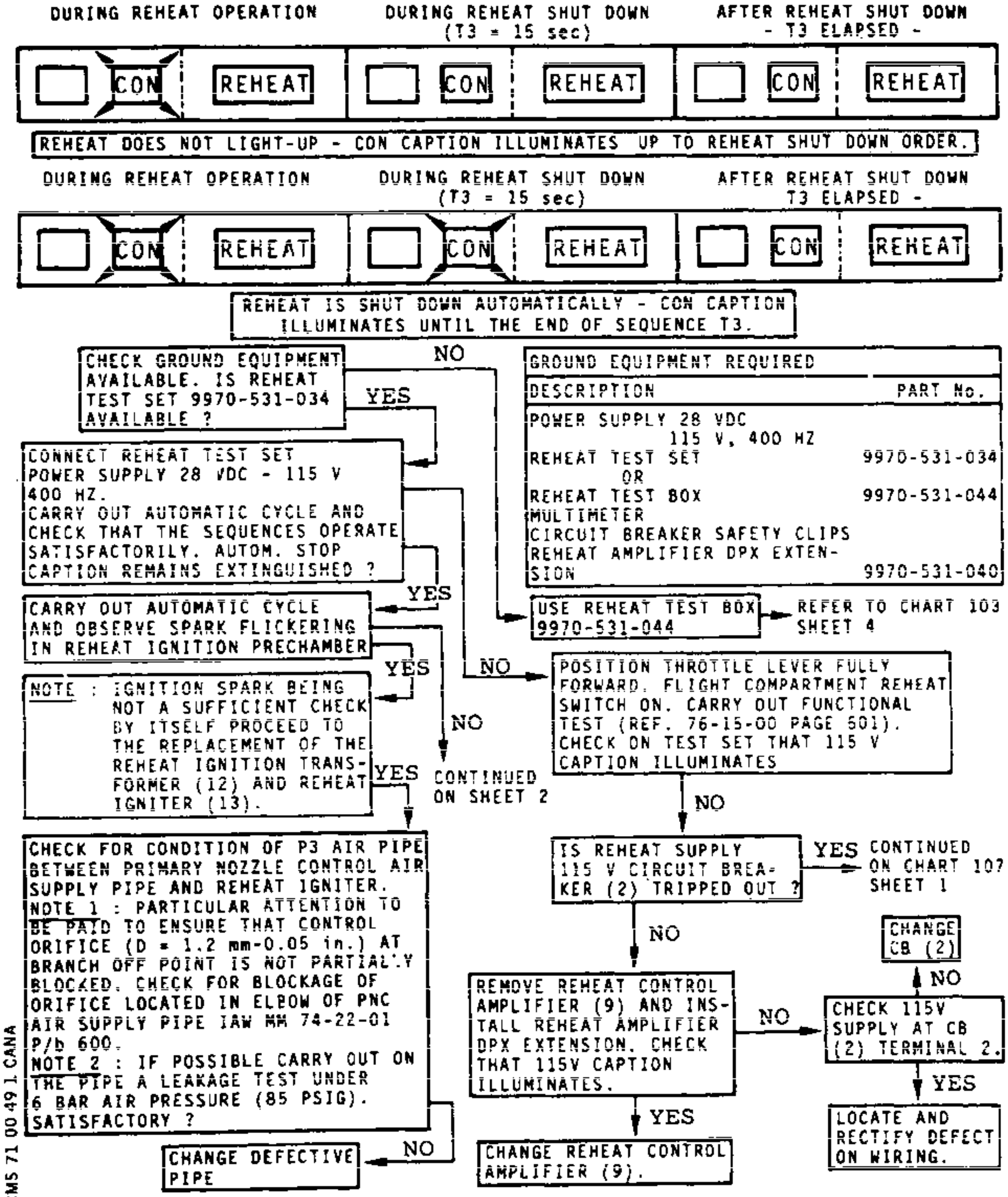
Chart 102 (Sheet 3 of 3)



CMS 71 00 49 1 CANA

R Chart 103 (Sheet 1 of 7) B

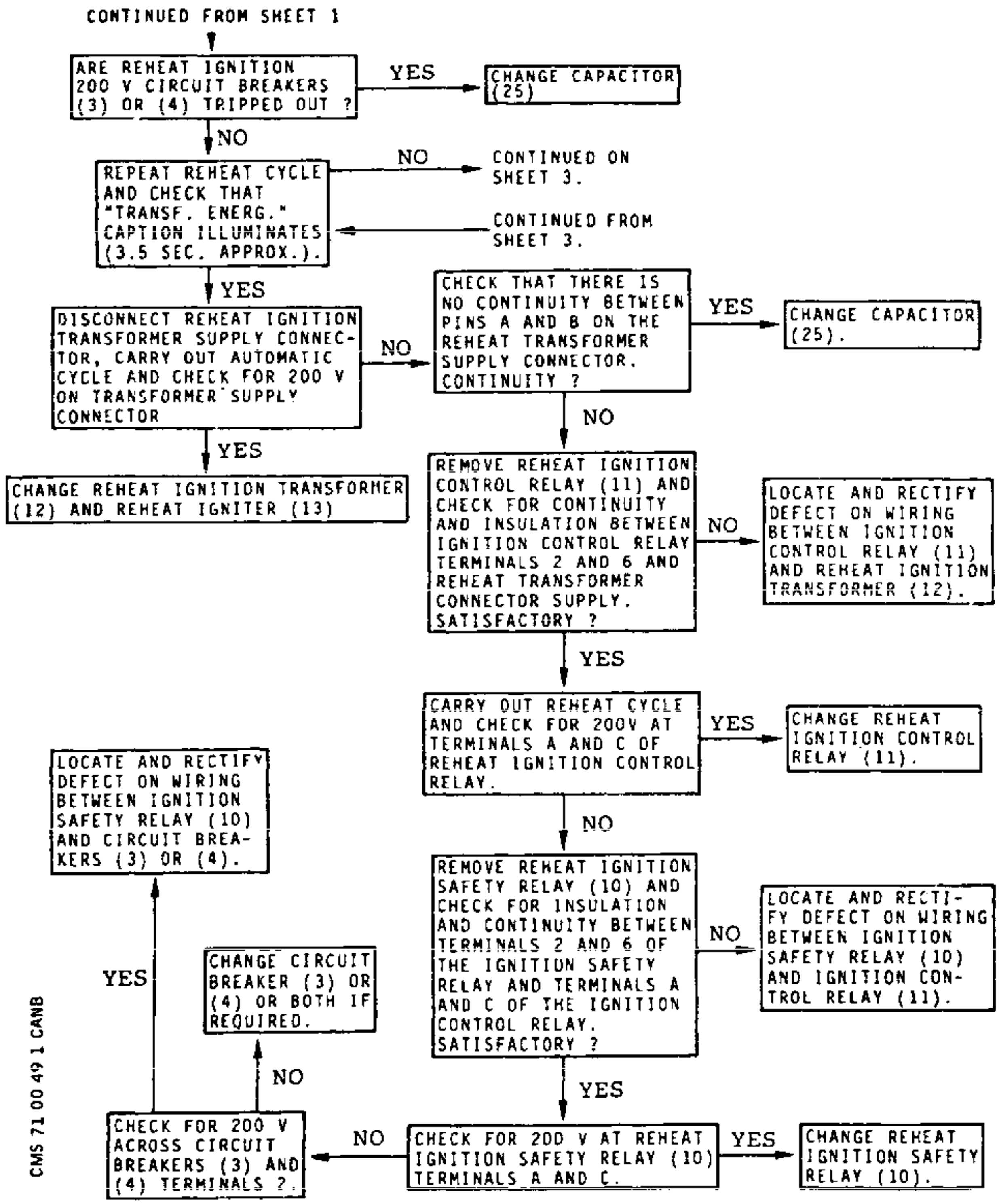
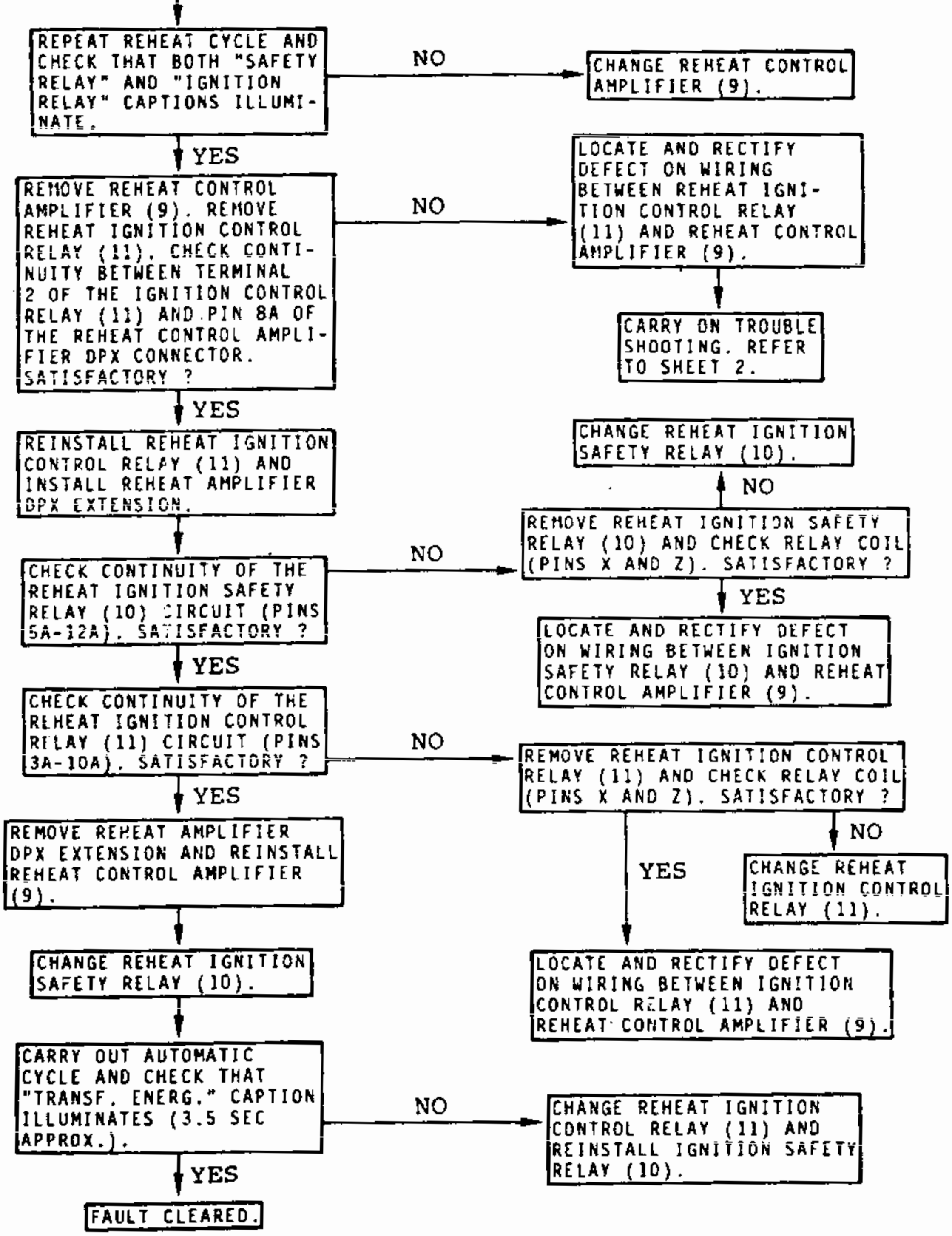


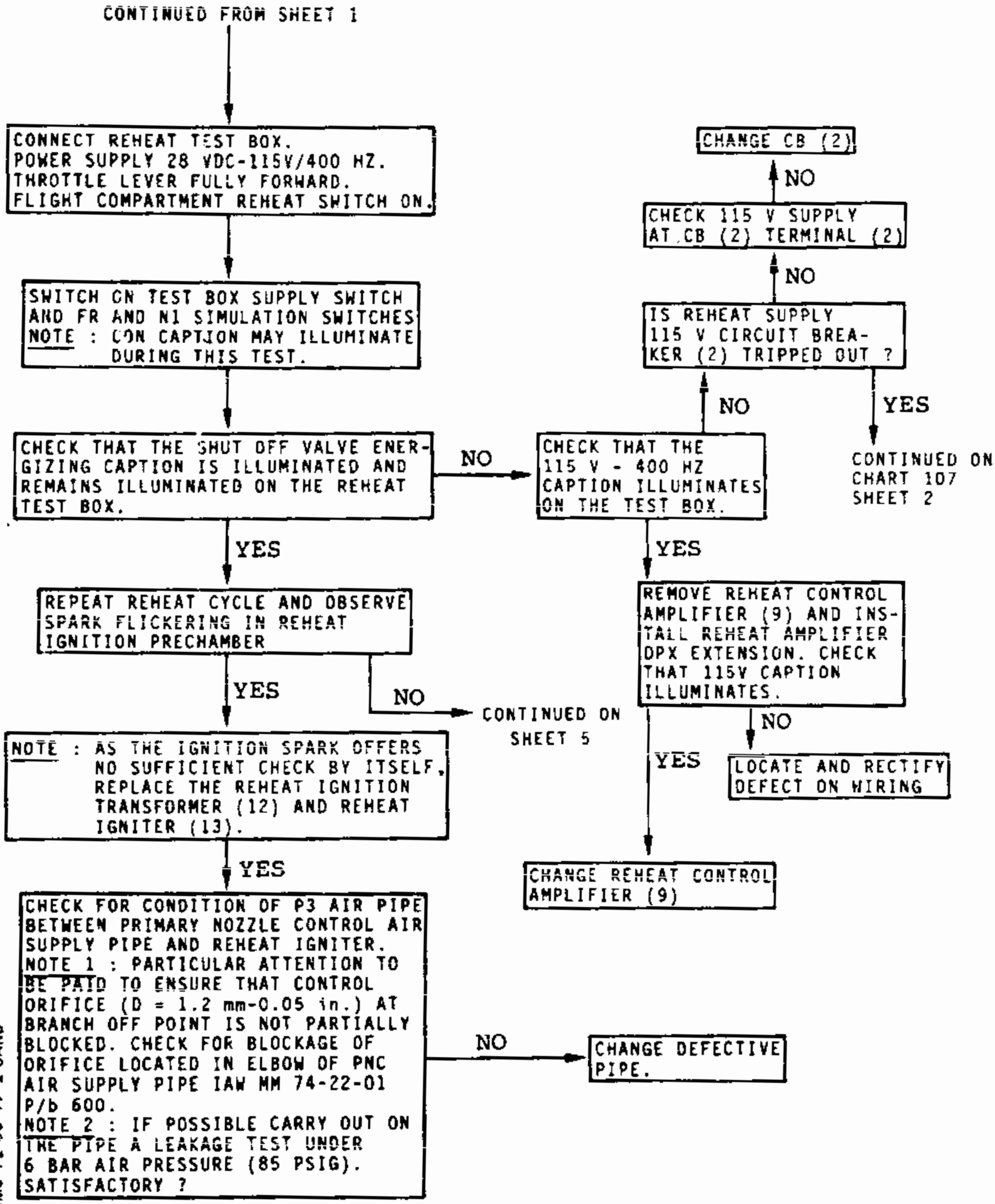
Chart 103 (Sheet 2 of 7)

CONTINUED FROM SHEET 2



CMS 71 00 49 1 CANC

Chart 103 (Sheet 3 of 7)

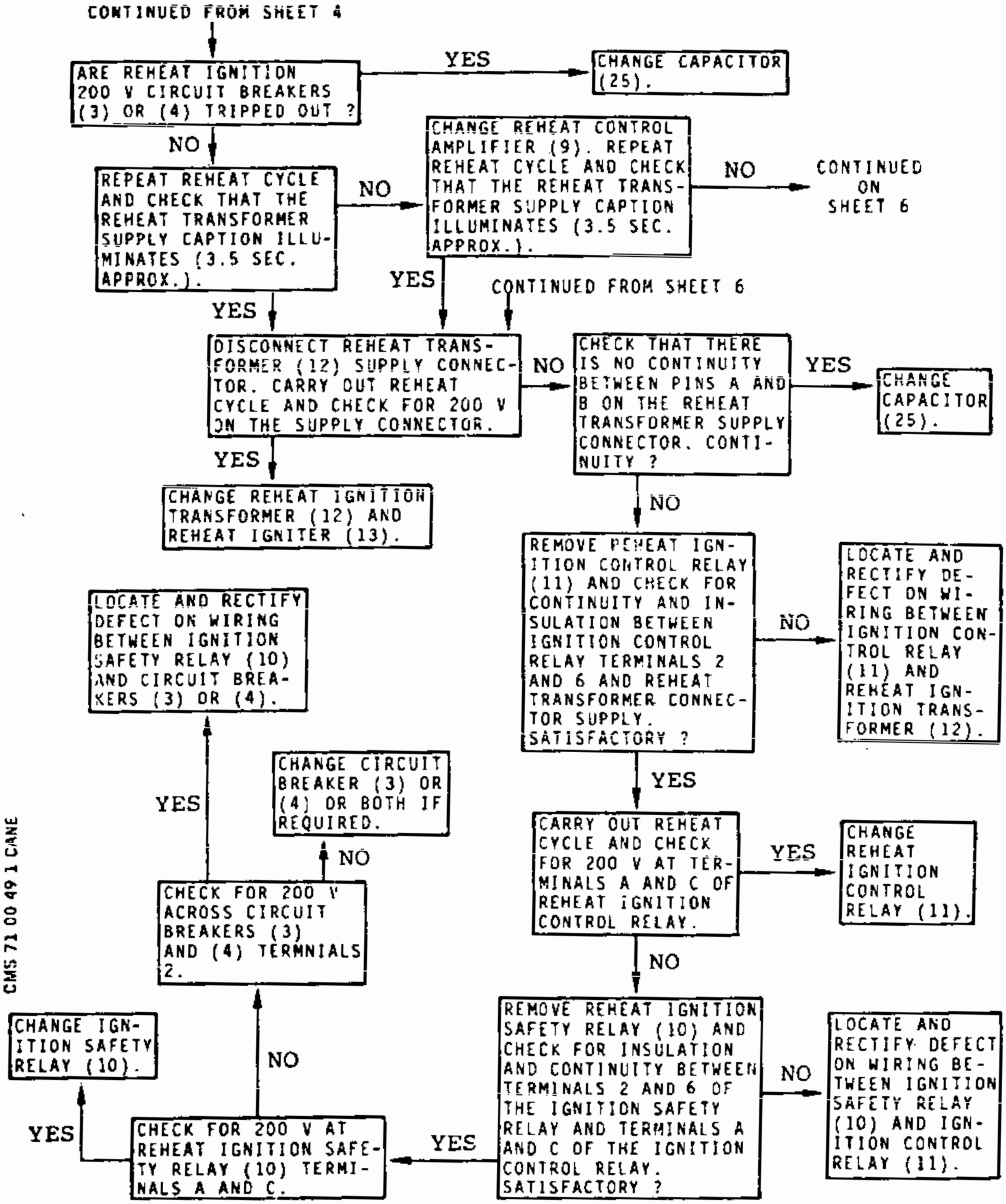


CMS 71 00 49 1 CAND

R

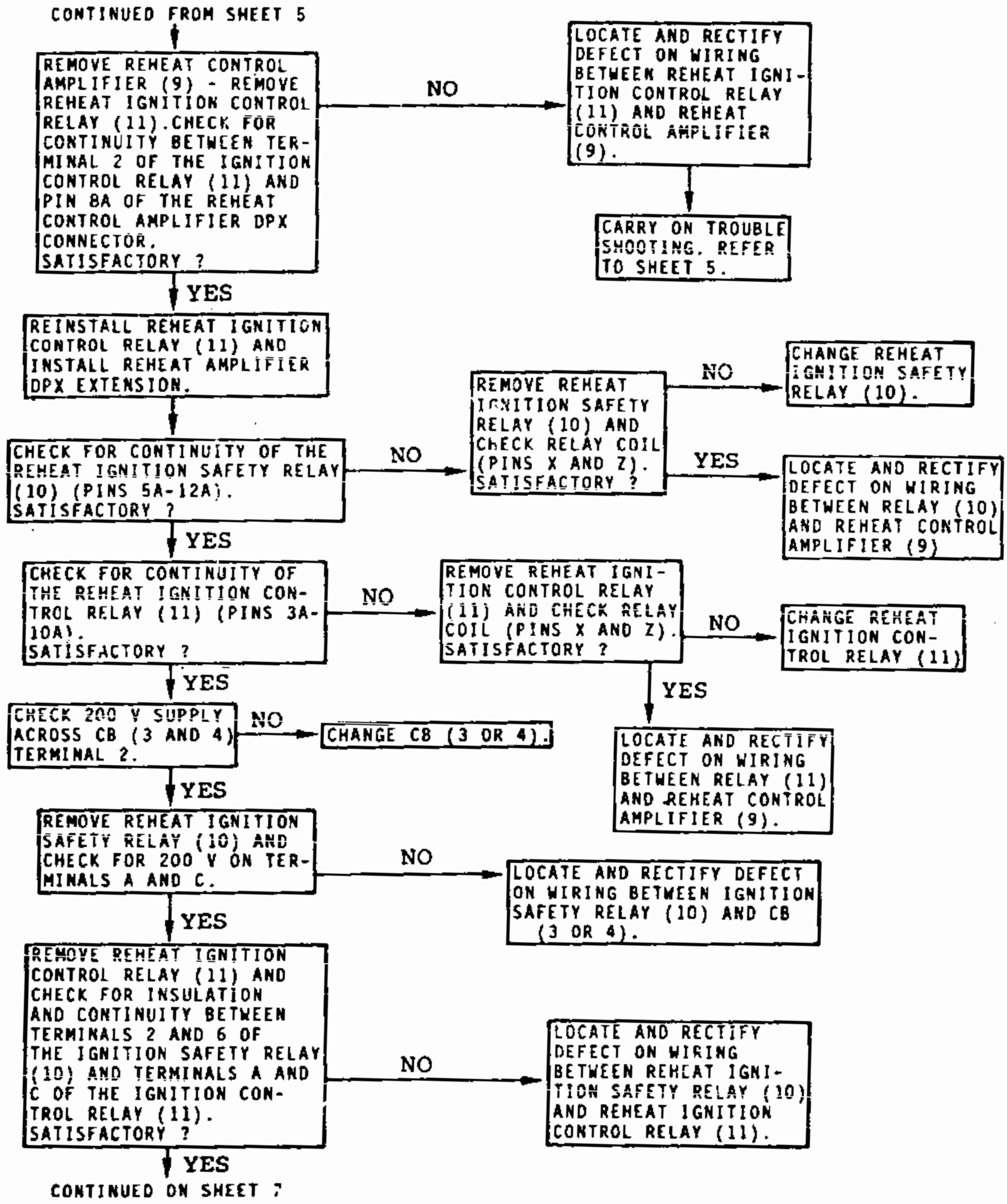
Chart 103 (Sheet 4 of 7)

B



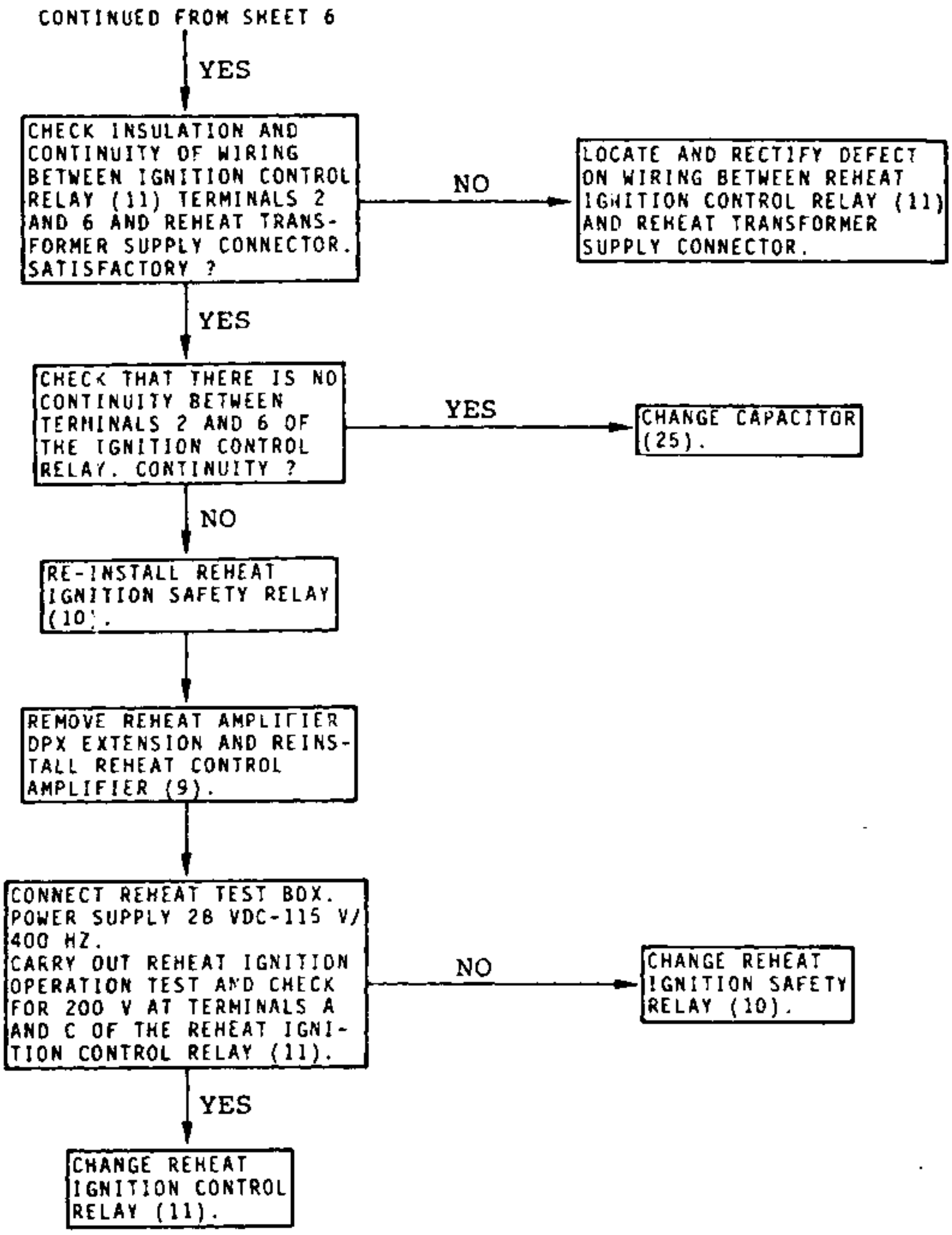
CMS 71 00 49 1 CANE

Chart 103 (Sheet 5 of 7)



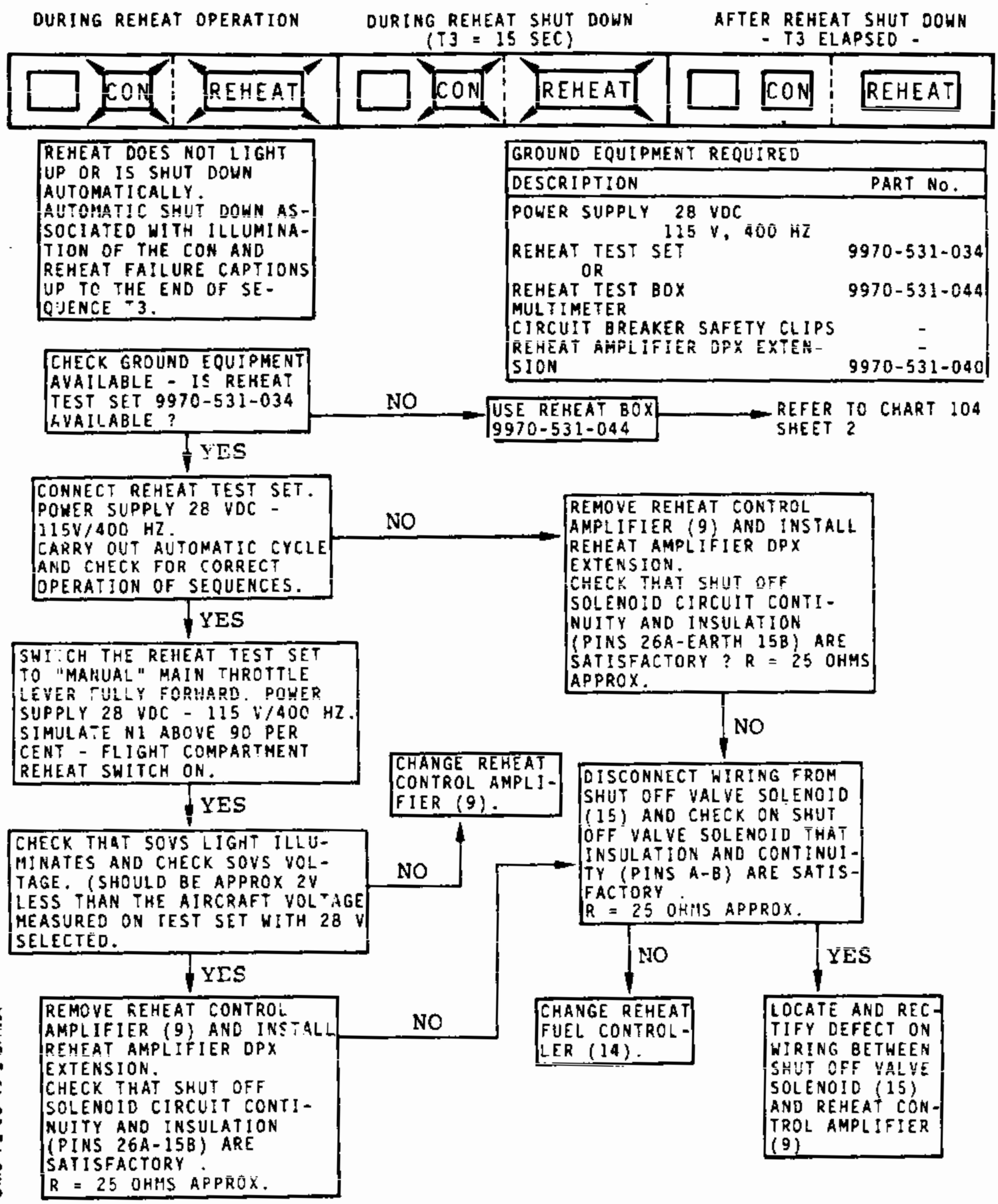
CMS 71 00 49) CANF

Chart 103 (Sheet 6 of 7)



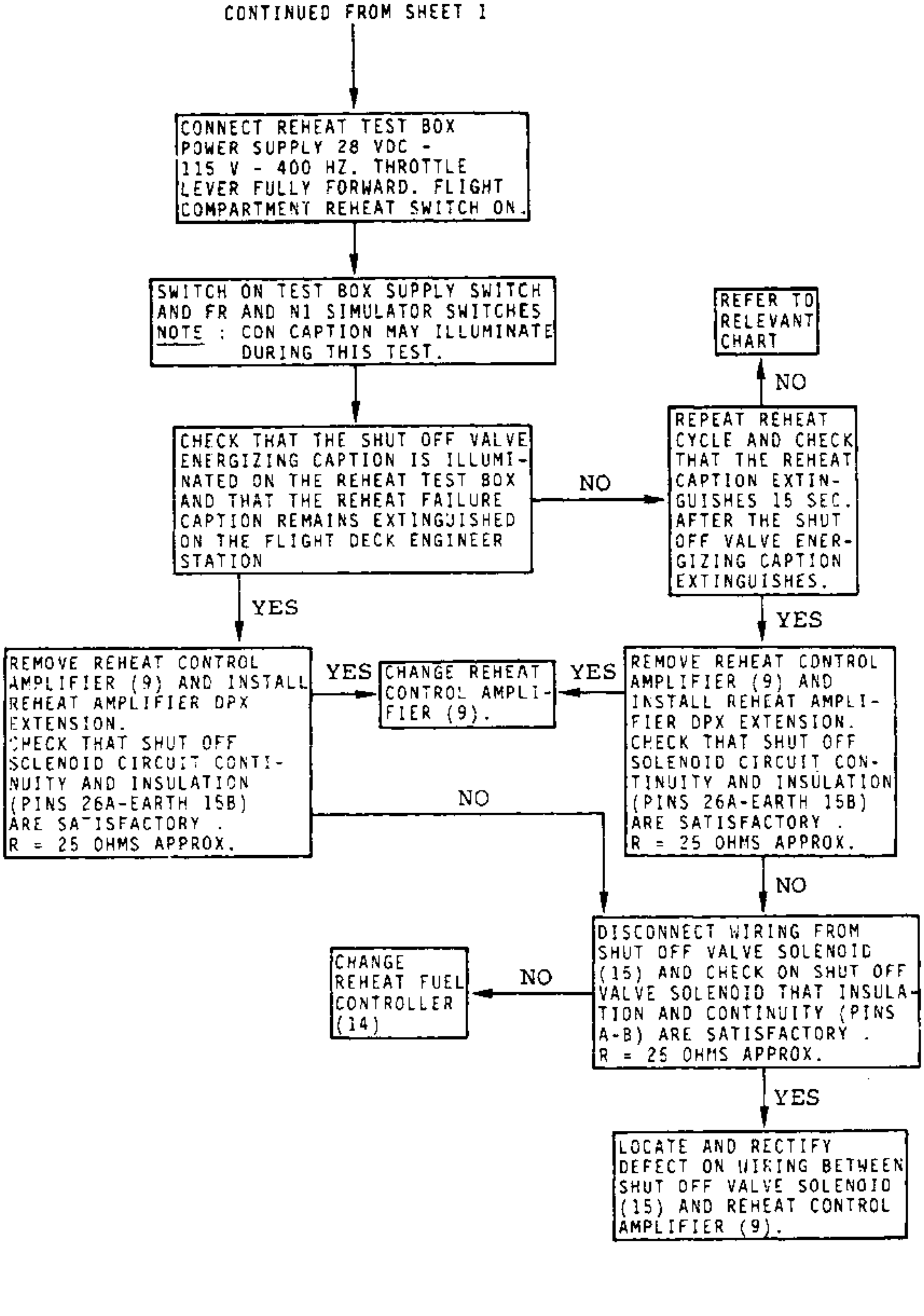
CMS 71 00 49 1 CANG

Chart 103 (Sheet 7 of 7)



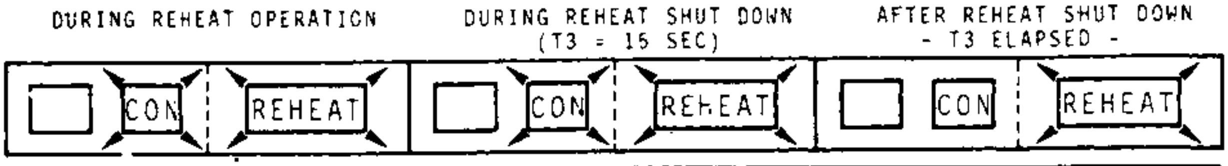
R

Chart 104 (Sheet 1 of 2)



CMS 71 00 49 1 DAMB

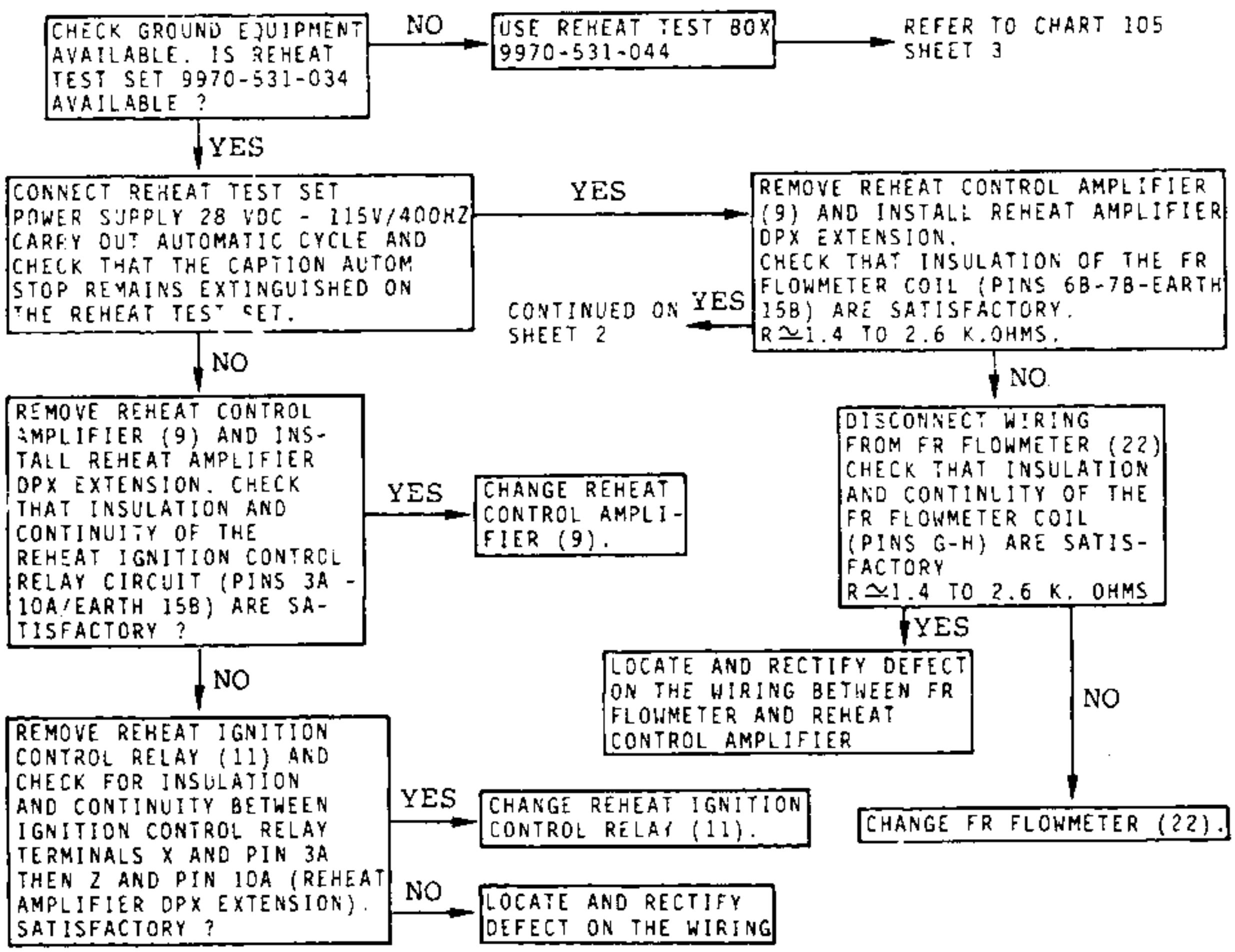
Chart 104 (Sheet 2 of 2)



REHEAT DOES NOT LIGHT UP OR IS SHUT DOWN AUTOMATICALLY. CON CAPTION ILLUMINATES UP TO THE END OF SEQUENCE T3 - REHEAT FAILURE CAPTION ILLUMINATES PERMANENTLY.

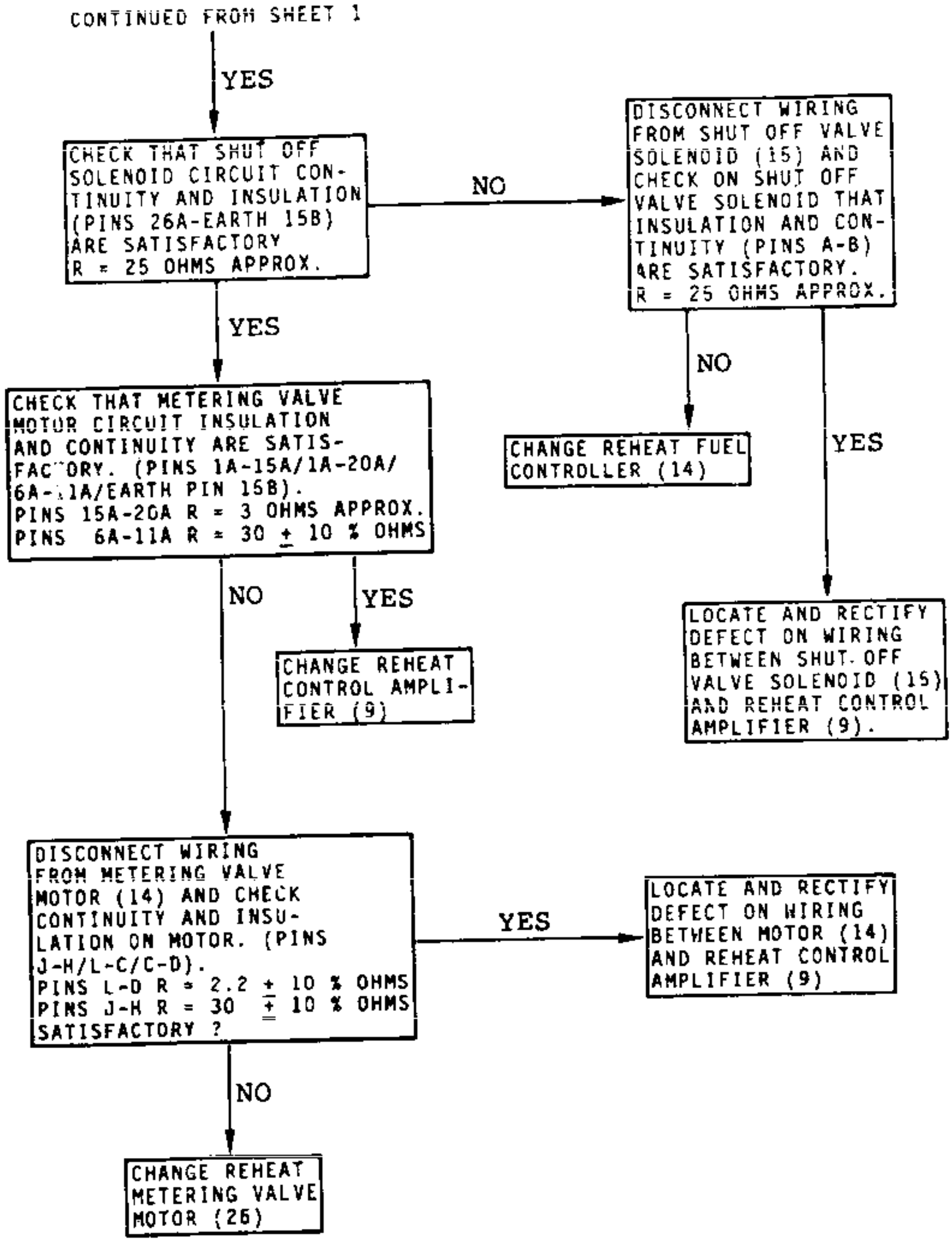
NOTE : TRIPPING AND RESETTING THE 28 VDC - 115V/400 HZ REHEAT CONTROL AMPLIFIER SUPPLY CIRCUIT BREAKERS WILL EXTINGUISH REHEAT CAPTION.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART No.
POWER SUPPLY 28 VDC 115 V, 400 HZ	
REHEAT TEST SET	9970-531-034
OR	
REHEAT TEST BOX	9970-531-044
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-
REHEAT AMPLIFIER DPX EXTENSION	9970-531-040



CMS 71 00 49 1 EAMA

Chart 105 (Sheet 1 of 4)



CMS 71 00 49 1 EAMB

Chart 105 (Sheet 2 of 4)

CONTINUED FROM SHEET 1

NOTE : TRIPPING AND RESETTING THE 28V-115V/400 HZ REHEAT CONTROL AMPLIFIER CIRCUIT BREAKERS WILL EXTINGUISH REHEAT CAPTION

CONNECT REHEAT TEST BOX. POWER SUPPLY 28 VDC - 115 V/400 HZ. THROTTLE LEVER FULLY FORWARD. FLIGHT COMPARTMENT REHEAT SWITCH ON.

SWITCH ON TEST BOX SUPPLY SWITCH AND FR AND N1 SIMULATION SWITCHES.
NOTE : CON CAPTION MAY ILLUMINATE DURING THIS TEST.

CHECK THAT THE SHUT OFF VALVE ENERGIZING CAPTION IS ILLUMINATED AND REMAINS ILLUMINATED ON THE REHEAT TEST BOX.

YES

CHECK FR LINES INTEGRITY. FLIP TEST SWITCH TO FR AND CHECK THAT RELEVANT INDICATOR LIGHT ILLUMINATES.

YES

CONTINUED ON SHEET 4

NO

REMOVE REHEAT CONTROL AMPLIFIER AND INSTALL REHEAT AMPLIFIER DPX EXTENSION. CHECK THAT INSULATION AND CONTINUITY OF THE FR FLOWMETER COIL (PINS 6B-7B-EARTH 15B) ARE SATISFACTORY. R = 1.4 TO 2.6 K.OHMS.

NO

DISCONNECT WIRING FROM FR FLOWMETER (22). CHECK THAT INSULATION AND CONTINUITY OF THE FR FLOWMETER COIL (PINS G-H) ARE SATISFACTORY. R = 1.4 TO 2.6 K.OHMS.

YES

LOCATE AND RECTIFY DEFECT ON THE WIRING BETWEEN FR FLOWMETER (22) AND REHEAT CONTROL AMPLIFIER (9)

NO

CHANGE FR FLOWMETER (22)

NO

REMOVE REHEAT AMPLIFIER (9) AND INSTALL REHEAT AMPLIFIER DPX EXTENSION. CHECK THAT INSULATION AND CONTINUITY OF THE REHEAT IGNITION CONTROL RELAY CIRCUIT (PINS 3A-10A-EARTH 15B) ARE SATISFACTORY ?

YES

CHANGE REHEAT CONTROL AMPLIFIER (9)

NO

REMOVE REHEAT IGNITION CONTROL RELAY (11) AND CHECK FOR INSULATION AND CONTINUITY BETWEEN IGNITION CONTROL RELAY TERMINALS X AND PIN 3A, THEN Z AND PIN 10A (REHEAT DPX EXTENSION) SATISFACTORY ?

YES

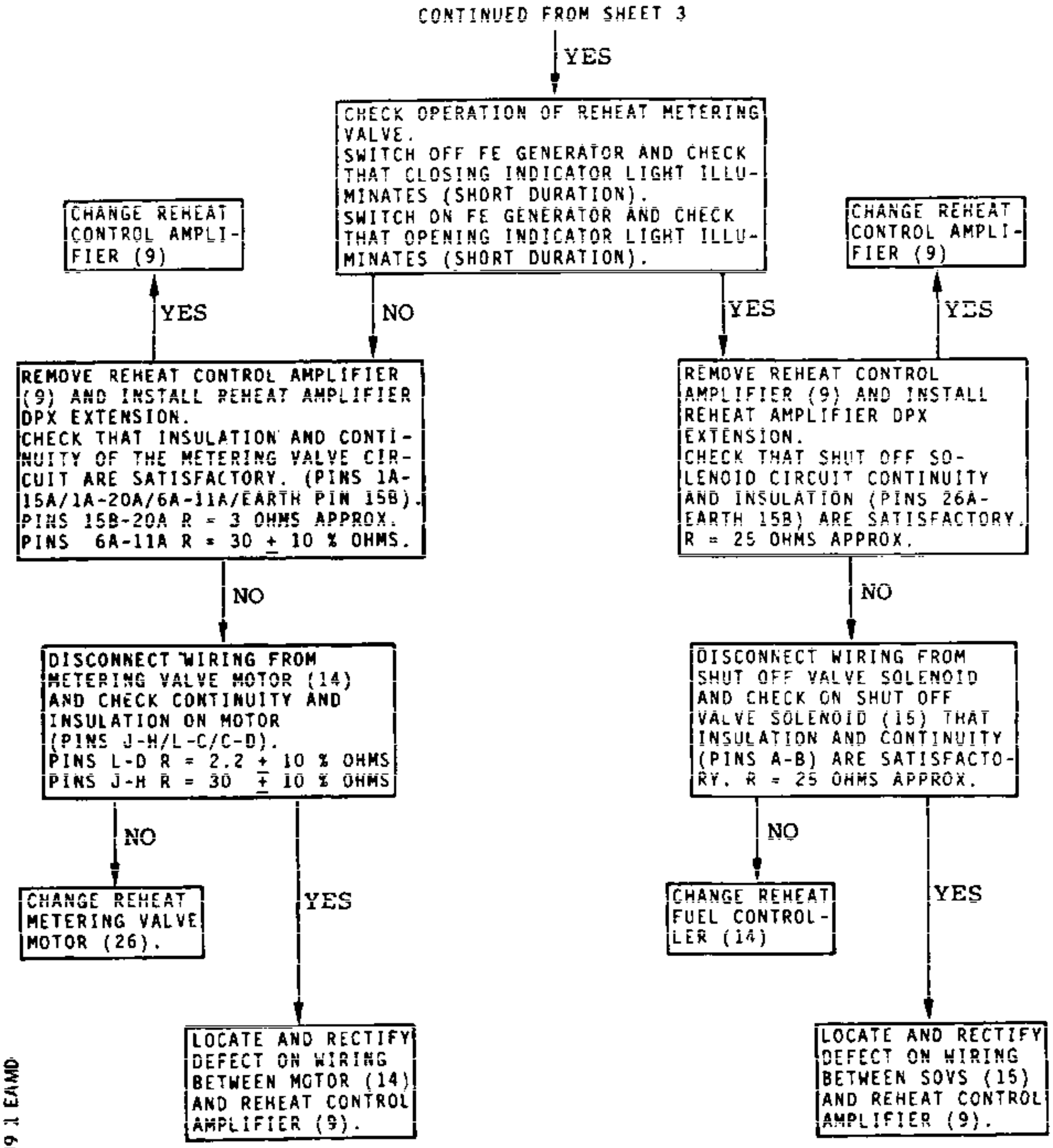
CHANGE REHEAT IGNITION CONTROL RELAY (11).

NO

LOCATE AND RECTIFY DEFECT ON THE WIRING.

CMS 71 00 49 1 EAMC

Chart 105 (Sheet 3 of 4)



CMS 71 00 49 1 EAMD

Chart 105 (Sheet 4 of 4)

DURING REHEAT OPERATION — DURING REHEAT SHUT DOWN (T3 = 15 SEC) — AFTER REHEAT SHUT DOWN - T3 ELAPSED -

REHEAT DOES NOT LIGHT UP. NO AUTOMATIC SHUT DOWN. CON CAPTION ILLUMINATES UP TO REHEAT SHUT DOWN ORDER. REHEAT FAILURE CAPTION ILLUMINATES PERMANENTLY.

NOTE : TRIPPING AND RESETTING THE 28 VDC - 115 V/400 HZ REHEAT CONTROL AMPLIFIER SUPPLY CIRCUIT BREAKERS WILL EXTINGUISH REHEAT CAPTION.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART No.
POWER SUPPLY 28 VDC 115 V, 400 HZ	
REHEAT TEST SET OR	9970-531-034
REHEAT TEST BOX	9970-531-044
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-
REHEAT AMPLIFIER DPX EXTENSION	9970-531-040

CHECK GROUND EQUIPMENT AVAILABLE - IS REHEAT TEST SET 9970-531-034 AVAILABLE
- NO → USE REHEAT TEST BOX 9970-531-044 → REFER TO CHART 106 SHEET 2
- YES ↓

CONNECT REHEAT TEST SET POWER SUPPLY 28 VDC - 115 V/400 HZ CARRY OUT AUTOMATIC CYCLE AND CHECK THAT THE CAPTION AUTOM STOP REMAINS EXTINGUISHED ON THE REHEAT TEST SET.
- NO → TROUBLE SHOOT FOLLOWING CHART 105
- YES ↓

CARRY OUT AUTOMATIC CYCLE AND CHECK THAT TRANSFORMER ENERGIZED CAPTION ILLUMINATES (SHORT DURATION 3.5 SEC. APPROX.)
- YES → TROUBLE SHOOT FOLLOWING CHART 105
- NO ↓

REMOVE REHEAT CONTROL AMPLIFIER (9) AND INSTALL REHEAT AMPLIFIER DPX EXTENSION. CHECK THAT INSULATION AND CONTINUITY OF THE REHEAT IGNITION SAFETY RELAY CIRCUIT ARE SATISFACTORY. (PINS 5A-12A-EARTH 15B).
- YES → CHANGE REHEAT CONTROL AMPLIFIER (9)
- NO → REMOVE REHEAT IGNITION SAFETY RELAY AND CHECK FOR INSULATION AND CONTINUITY BETWEEN SAFETY RELAY TERMINALS X AND PIN 5A THEN Z AND PIN 12A (REHEAT AMPLIFIER DPX EXTENSION). SATISFACTORY ?
  - NO → LOCATE AND RECTIFY DEFECT ON WIRING
  - YES → CHANGE REHEAT IGNITION SAFETY RELAY (10).

CMS 71 00 49 1 FAMA

Chart 106 (Sheet 1 of 2)

CONTINUED FROM SHEET 1

CONNECT REHEAT TEST BOX POWER SUPPLY 28 VDC - 115 V 400 HZ. THROTTLE LEVER FULLY FORWARD. FLIGHT COMPARTMENT REHEAT SWITCH ON.

SWITCH ON TEST BOX SUPPLY SWITCH AND FR AND N1 SIMULATOR SWITCHES.
NOTE : CON CAPTION MAY ILLUMINATE DURING THE TEST.

CHECK THAT THE SHUT OFF VALVE CAPTION IS ILLUMINATED AND REMAINS ILLUMINATED ON THE REHEAT TEST BOX.

NO → TROUBLE SHOOT FOLLOWING CHART 105

YES ↓

CHECK REHEAT IGNITION SAFETY RELAY.
SWITCH OFF N1 SIMULATION SWITCH.
SWITCH ON N1 SIMULATION SWITCH AND CHECK THAT REHEAT IGNITION TRANSFORMER SUPPLY CAPTION ILLUMINATES DURING T2 (3.5 SEC APPROX.).

YES → TROUBLE SHOOT FOLLOWING CHART 105

NO ↓

REMOVE REHEAT AMPLIFIER (9) AND INSTALL REHEAT AMPLIFIER DPX EXTENSION.
CHECK THAT INSULATION AND CONTINUITY OF THE REHEAT IGNITION SAFETY RELAY CIRCUIT (PINS 5A - 12A - EARTH 15B) ARE SATISFACTORY.

YES → CHANGE REHEAT CONTROL AMPLIFIER (9)

NO ↓

REMOVE REHEAT IGNITION SAFETY RELAY (10) AND CHECK FOR INSULATION AND CONTINUITY BETWEEN SAFETY RELAY TERMINAL X AND PIN 5A THEN Z AND PIN 12A (REHEAT AMPLIFIER DPX EXTENSION).
SATISFACTORY ?

YES → CHANGE REHEAT IGNITION SAFETY RELAY (10).

NO → LOCATE AND RECTIFY DEFECT ON WIRING.

CMS 71 00 49 1 FAMB

Chart 106 (Sheet 2 of 2)

DURING REHEAT OPERATION	DURING REHEAT SHUT DOWN (T3 = 15 SEC)	AFTER REHEAT SHUT DOWN - T3 ELAPSED -
CON REHEAT	CON REHEAT	CON REHEAT

REHEAT DOES NOT LIGHT UP OR IS SHUT DOWN AUTOMATICALLY.
AUTOMATIC SHUT DOWN ASSOCIATED WITH THE PERMANENT ILLUMINATION OF THE REHEAT FAILURE CAPTION.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART No.
POWER SUPPLY 28 VDC 115 V, 400 HZ	
REHEAT TEST SET	9970-531-034
OR	
REHEAT TEST BOX	9970-531-044
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-
REHEAT AMPLIFIER DPX EXTENSION	9970-531-040

CHECK GROUND EQUIPMENT AVAILABLE - IS REHEAT TEST SET 9970-531-034 AVAILABLE ?

- NO → USE REHEAT TEST BOX 9970-531-044. → REFER TO CHART 107 SHEET 2
- YES ↓

CONNECT REHEAT TEST SET POWER SUPPLY 28 VDC - 115 V/ 400 HZ.
CARRY OUT AUTOMATIC CYCLE AND CHECK THAT METERING VALVE OPEN CAPTION ILLUMINATES AND AUTOM. STOP CAPTION REMAINS EXTINGUISHED ?

- NO → REMOVE REHEAT CONTROL AMPLIFIER (9) AND INSTALL REHEAT AMPLIFIER DPX EXTENSION.
  CHECK THAT INSULATION AND CONTINUITY OF THE REHEAT METERING VALVE MOTOR CIRCUIT ARE SATISFACTORY. (PINS 6A-11A/1A-15A/1A-20A/4A-9A/18B-35B/EARTH PIN 15B).
  PINS 6A-11A R = 30 + 10 % OHMS
  PINS 15A-20A R = 3 OHMS APPROX.
  PINS 18B-35B R = 1470 ± 10 % OHMS
  PINS 4A- 9A R = 380 ∓ 10 % OHMS

  CONTINUED FROM CHART 103 SHEET 1

  - YES → CHANGE REHEAT CONTROL AMPLIFIER (9)
  - NO → DISCONNECT WIRING FROM METERING VALVE MOTOR (14) AND CHECK INSULATION AND CONTINUITY ON MOTOR - PINS J-H/L-C/C-D/I-F/G-A SATISFACTORY
    PINS J-H R = 30 + 10 % OHMS
    PINS L-D R = 2.2 ∓ 10 % OHMS
    PINS I-F R = 1470 ∓ 10 % OHMS
    PINS G-A R = 380 ∓ 10 % OHMS
    - NO → CHANGE REHEAT METERING VALVE MOTOR (26)
    - YES → LOCATE AND RECTIFY DEFECT ON THE WIRING BETWEEN MOTOR (14) AND REHEAT CONTROL AMPLIFIER(9)

  CONTINUED FROM CHART 103 SHEET 1

- YES ↓

REPEAT AUTOMATIC CYCLE AND CHECK ON AC VOLTMETER :
- MOTOR REF. OUTPUT VOLTAGE : 115 VOLTS
- MOTOR CONT OUTPUT VOLTAGE : >5 VOLTS.

SATISFACTORY ?

- NO → CHANGE REHEAT METERING VALVE MOTOR (26).
- YES → CHANGE REHEAT CONTROL AMPLIFIER (9).

CMS 71 00 49 1 GAMA

Chart 107 (Sheet 1 of 2)

CONTINUED FROM SHEET 1

- CONNECT REHEAT TEST BOX.
- POWER SUPPLY 28 VDC - 115 V/400 HZ.
- THROTTLE LEVER FULLY FORWARD.
- FLIGHT COMPARTMENT REHEAT SWITCH ON.

SWITCH ON TEST BOX SUPPLY SWITCH AND FR AND N1 SIMULATION SWITCHES.
NOTE : CON CAPTION MAY ILLUMINATE DURING THIS TEST.

CHECK THAT THE SHUT OFF VALVE ENERGIZING CAPTION IS ILLUMINATED AND REMAINS ILLUMINATED ON THE REHEAT TEST BOX.

YES

CHECK OPERATION OF REHEAT METERING VALVE.
SWITCH OFF FE GENERATOR AND CHECK THAT CLOSING INDICATOR LIGHT ILLUMINATES SHORT DURATION.
SWITCH ON FE GENERATOR AND CHECK THAT OPENING INDICATOR LIGHT ILLUMINATES SHORT DURATION.

YES

CHANGE REHEAT CONTROL AMPLIFIER (9).

NO

CHANGE REHEAT METERING VALVE MOTOR (26).

NO

CONTINUED FROM CHART 103 SHEET 4

REMOVE REHEAT CONTROL AMPLIFIER (9) AND INSTALL REHEAT AMPLIFIER DPX EXTENSION.
CHECK THAT INSULATION AND CONTINUITY OF THE REHEAT METERING VALVE MOTOR CIRCUIT ARE SATISFACTORY. (PINS 6A-11A/1A-15A/1A-20A/4A-9A/18B-35B/EARTH PIN 15B).
PINS 6A-11A R = 30 + 10 % OHMS
PINS 15A-20A R = 3 OHMS APPROX.
PINS 18B-35B R = 1470 + 10 % OHMS
PINS 4A- 9A R = 380 ∓ 10 % OHMS

YES

CHANGE REHEAT CONTROL AMPLIFIER (9).

NO

DISCONNECT WIRING FROM METERING VALVE MOTOR (14) AND CHECK INSULATION AND CONTINUITY ON MOTOR - PINS J-H/L-C/C-D/I-F/G-A SATISFACTORY -
PINS J-H R = 30 ± 10 % OHMS
PINS L-D R = 2.2 ∓ 10 % OHMS
PINS I-F R = 1470 ∓ 10 % OHMS
PINS G-A R = 380 ∓ 10 % OHMS

NO

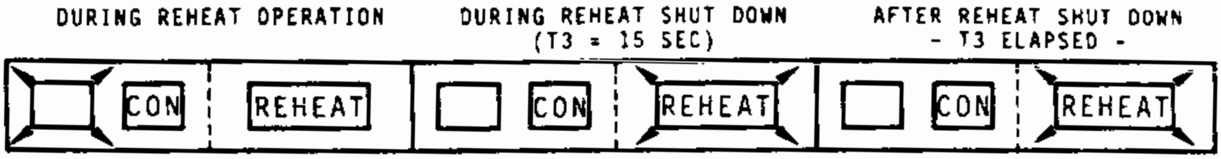
CHANGE REHEAT METERING VALVE MOTOR (26).

YES

LOCATE AND RECTIFY DEFECT ON THE WIRING BETWEEN MOTOR (14) AND REHEAT CONTROL AMPLIFIER (9).

CMS 71 00 49 1 GAMB

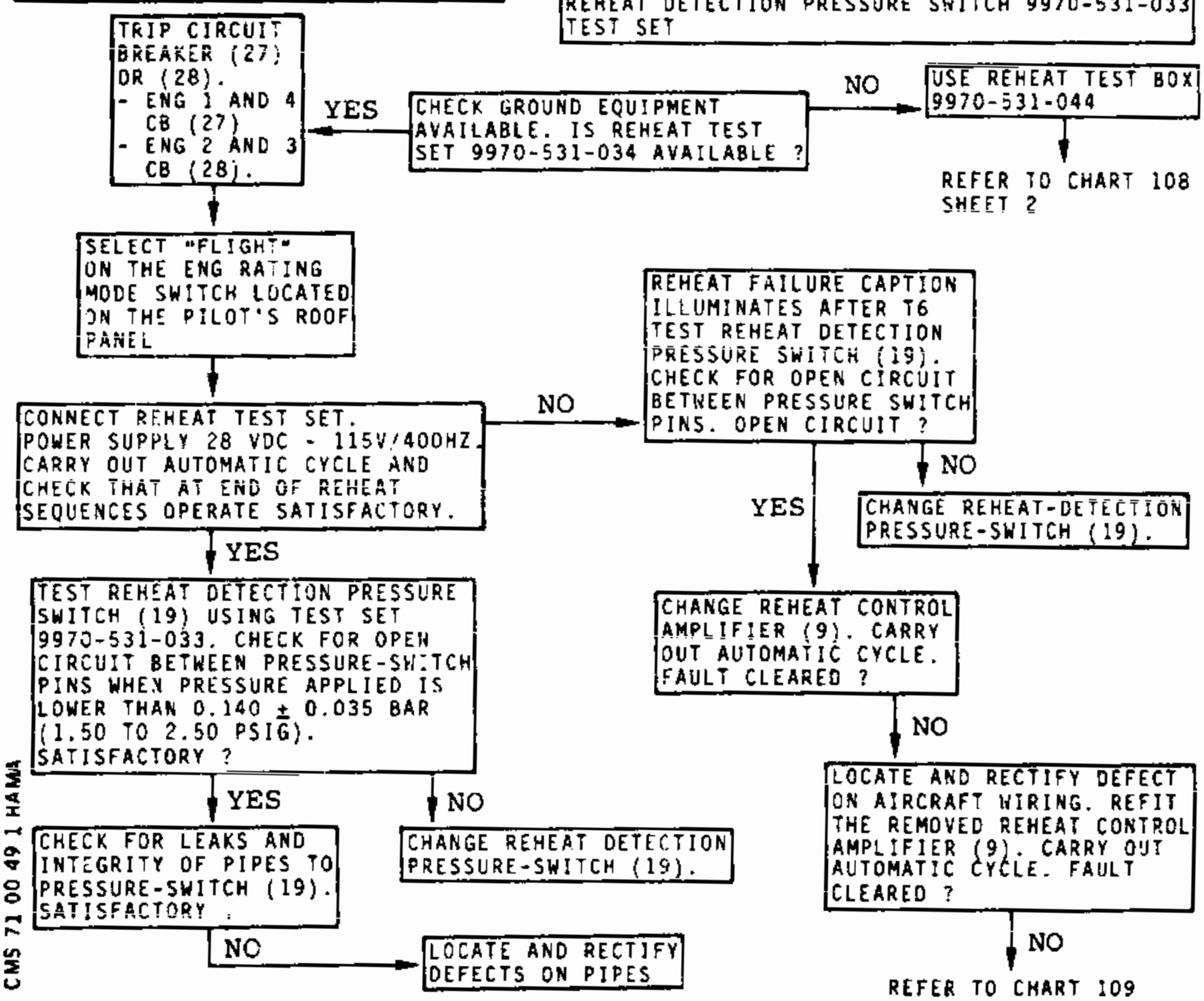
Chart 107 (Sheet 2 of 2)



REHEAT FAILURE CAPTION ILLUMINATES AFTER T6 SEQUENCE. (T6. = PERIOD OF 12 SECONDS STARTING FROM REHEAT STOP ORDER).

NOTE : TRIPPING AND RESETTING THE 28 VDC - 115V/400 HZ REHEAT CONTROL AMPLIFIER SUPPLY CIRCUIT BREAKERS WILL EXTINGUISH REHEAT CAPTION.

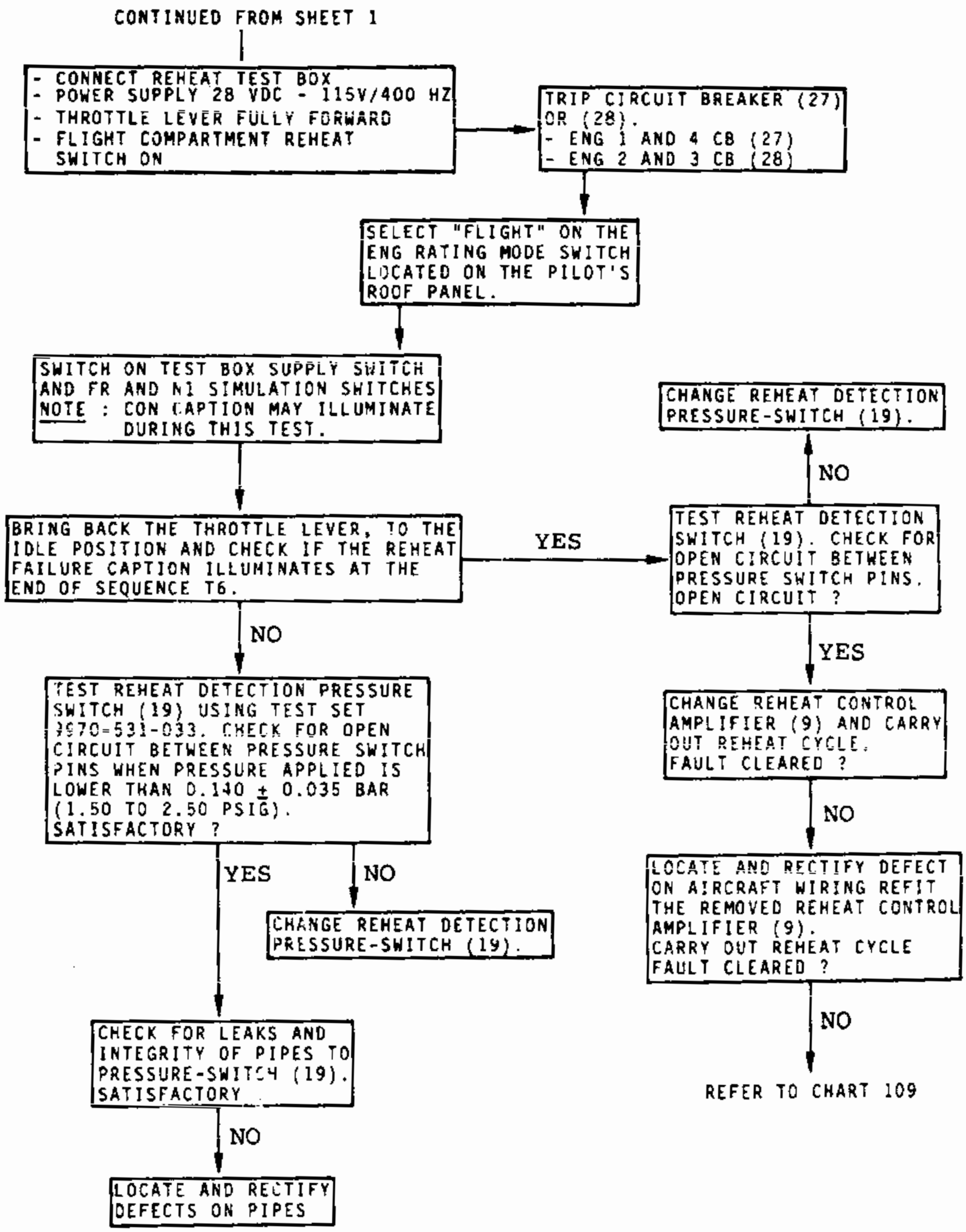
GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART No.
POWER SUPPLY 28 VDC 115 V/400 HZ	
REHEAT TEST SET OR	9970-531-034
REHEAT TEST BOX	9970-531-044
MULTIMETER	
CIRCUIT BREAKER SAFETY CLIPS	
REHEAT AMPLIFIER DPX EXTENSION	9970-531-040
REHEAT DETECTION PRESSURE SWITCH TEST SET	9970-531-033



CMS 71 00 49 1 HAMA

R

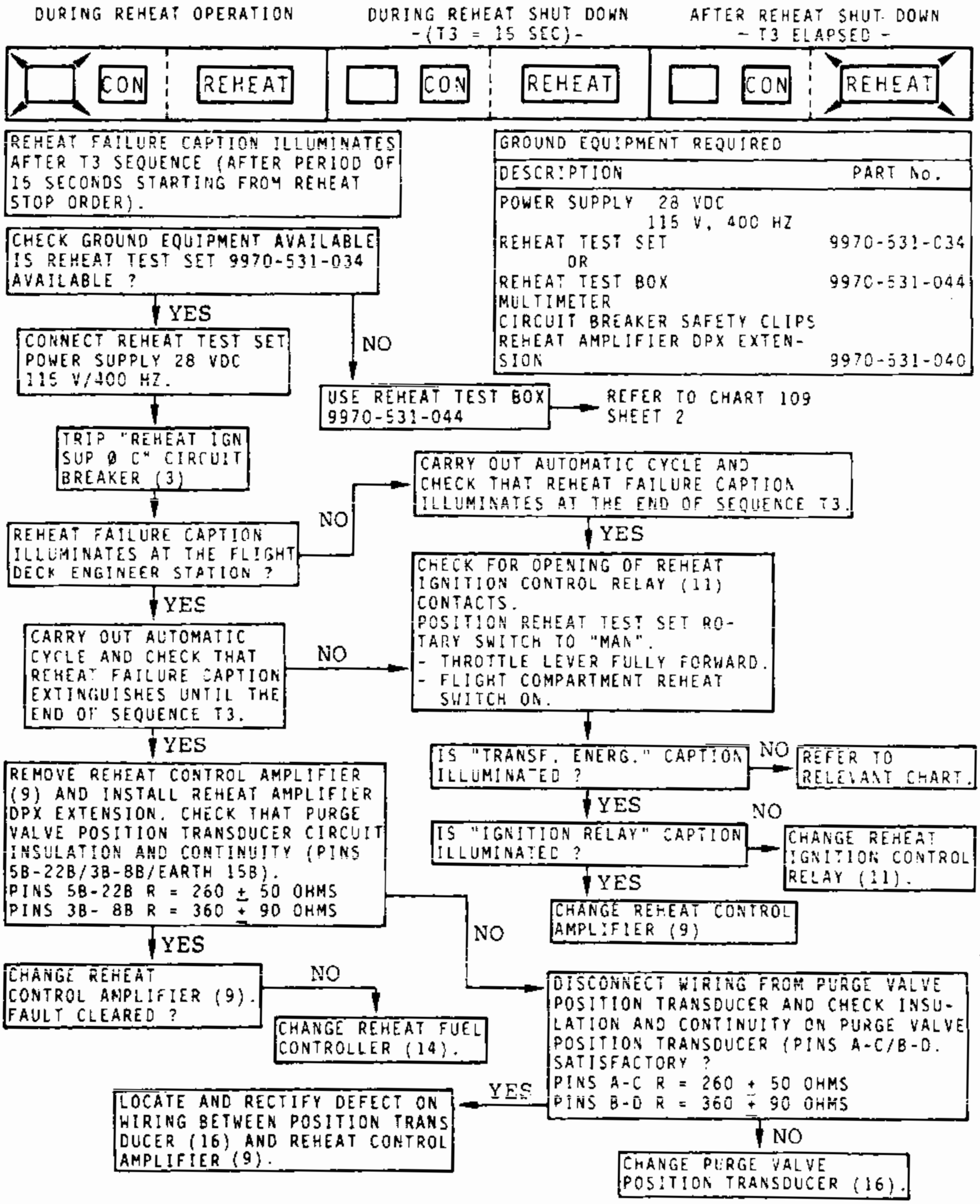
Chart 108 (Sheet 1 of 2)



CMS 71 00 49 1 HAMB

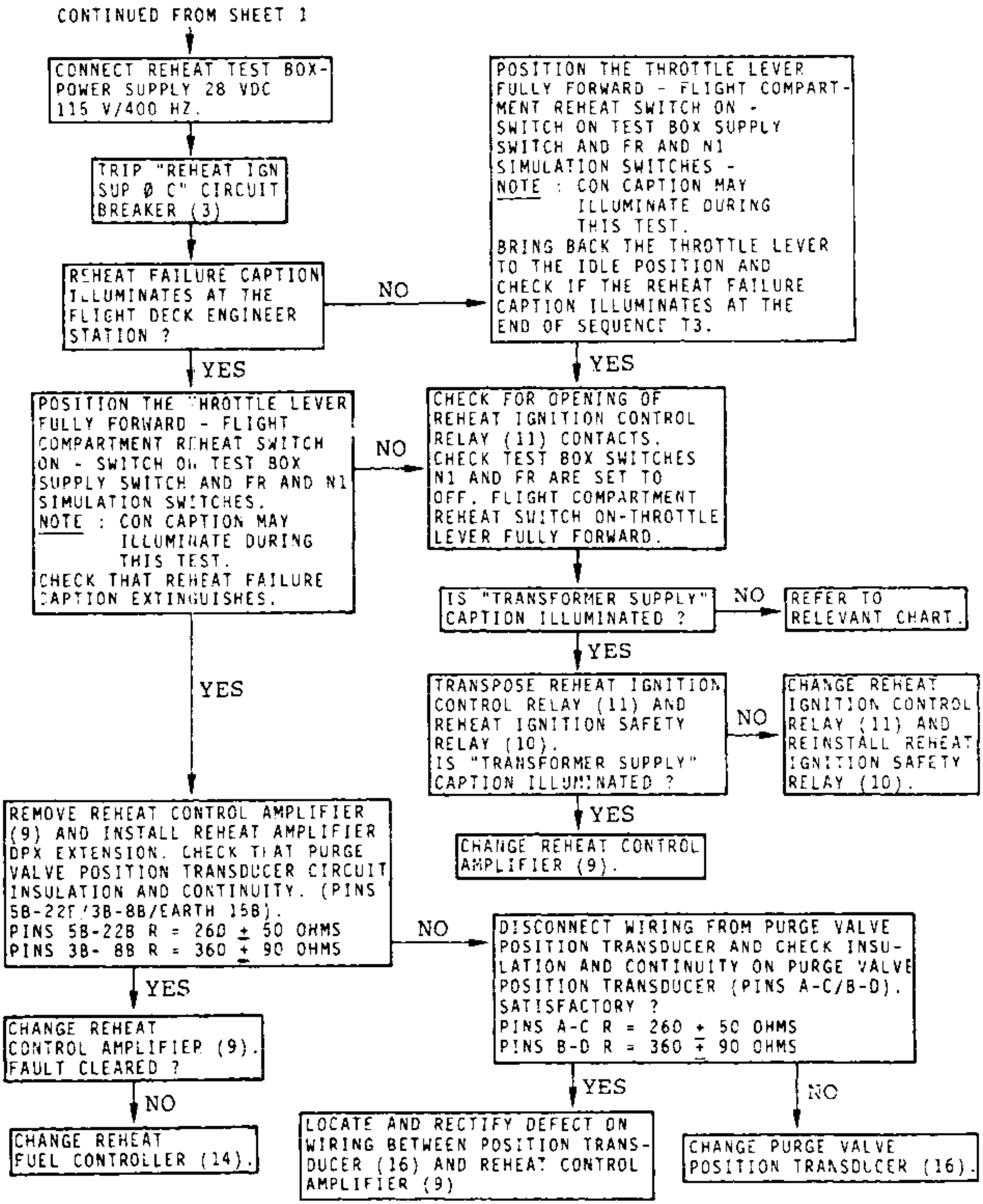
R

Chart 108 (Sheet 2 of 2)



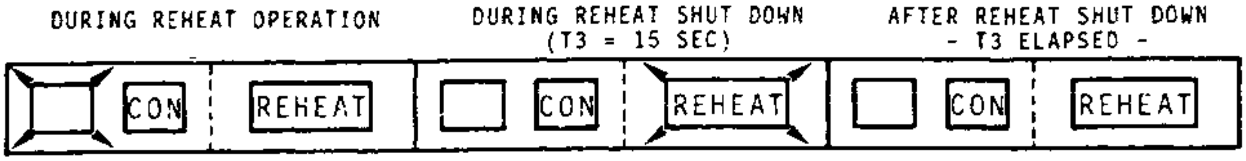
GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART No.
POWER SUPPLY 28 VDC 115 V, 400 HZ	
REHEAT TEST SET	9970-531-034
OR	
REHEAT TEST BOX	9970-531-044
MULTIMETER	
CIRCUIT BREAKER SAFETY CLIPS	
REHEAT AMPLIFIER DPX EXTENSION	9970-531-040

Chart 109 (Sheet 1 of 2)



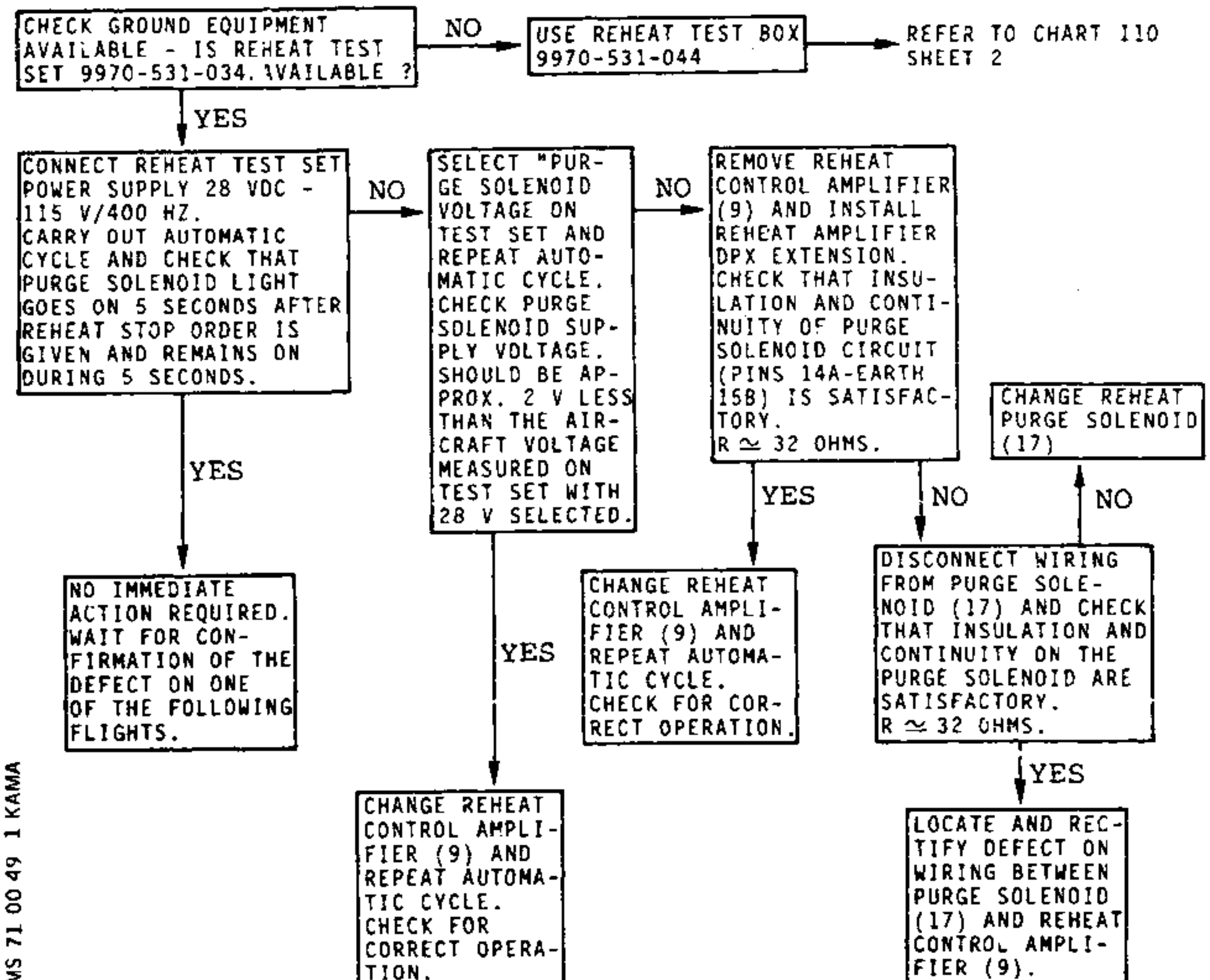
CMS 71 00 49 1 JAMB

Chart 109 (Sheet 2 of 2)



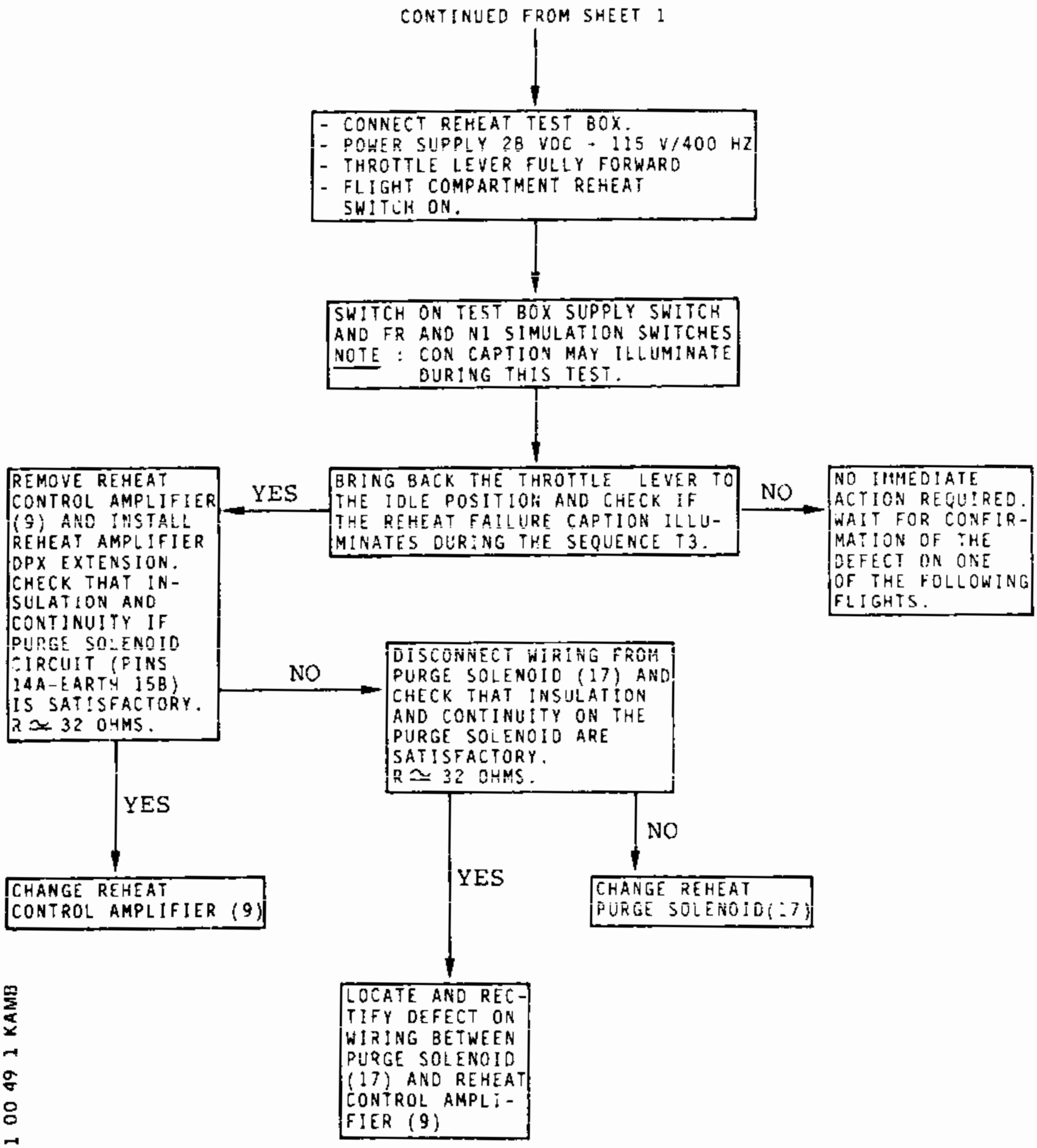
REHEAT FAILURE CAPTION ILLUMINATES 5 TO 10 SECONDS AFTER REHEAT STOP ORDER IS GIVEN.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART No.
POWER SUPPLY 28 VDC 115 V, 400 HZ	
REHEAT TEST SET	9970-531-034
OR	
REHEAT TEST BOX	9970-531-044
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-
REHEAT AMPLIFIER DPX EXTENSION	9970-531-040



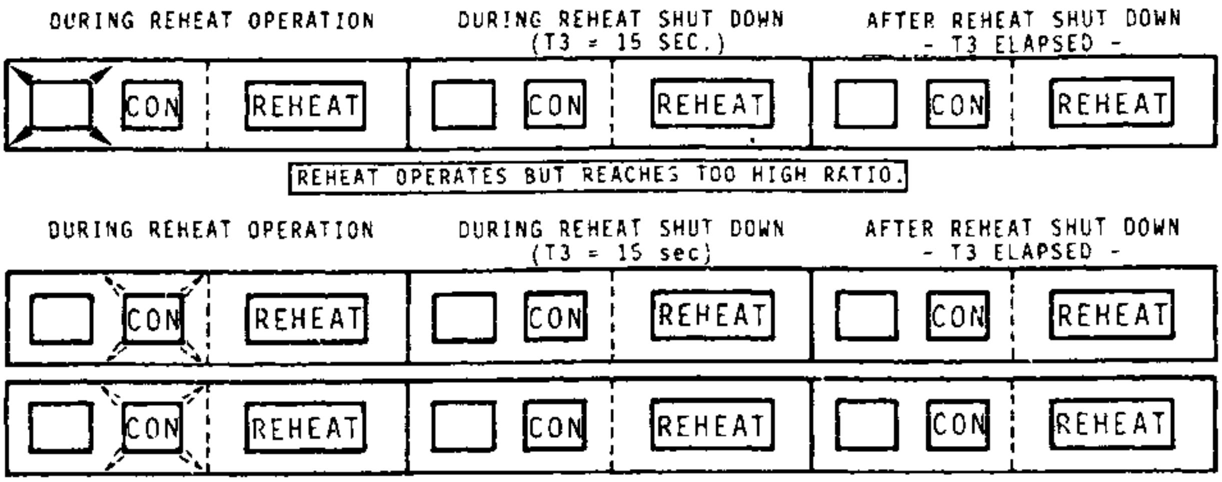
CMS 71 00 49 1 KAMA

Chart 110 (Sheet 1 of 2)



CMS 71 00 49 1 KAMB

Chart 110 (Sheet 2 of 2)



REHEAT DOES NOT LIGHT UP, OR OPERATES AT LOW AJ VALUE AND MAY EXTINGUISH. IF POWER SETTING IS INCREASED (CON CAPTION WILL FLASH OR ILLUMINATE IN SYMPATHY).
REHEAT OPERATES BUT IS LIMITED TO AN INTERMEDIATE RATIO OR FLUCTUATES (CON CAPTION MAY ILLUMINATE OR FLASH).

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART No.
POWER SUPPLY 28 VDC 115 V, 400 HZ	
REHEAT TEST SET OR	9970-531-034
REHEAT TEST BOX	9970-531-044
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-
REHEAT AMPLIFIER DPX EXTENSION	9970-531-040

CHECK GROUND EQUIPMENT AVAILABLE. IS REHEAT TEST SET 9970-531-034 AVAILABLE ?

NO → USE REHEAT TEST BOX 9970-531-044 → REFER TO CHART 111 SHEET 4

YES ↓

CONNECT REHEAT TEST SET. POWER SUPPLY 28 V - 115 V. TEST DENSITY CORRECTOR CIRCUIT BY TURNING CLOCKWISE AND RELEASING RESET KNOB ON FUEL FLOW INDICATOR.

→ CHECK THAT BUILT-IN INDICATING LIGHTS IN FUEL CONSUMED INDICATOR ILLUMINATE THEN EXTINGUISH WHEN KNOB IS RELEASED.

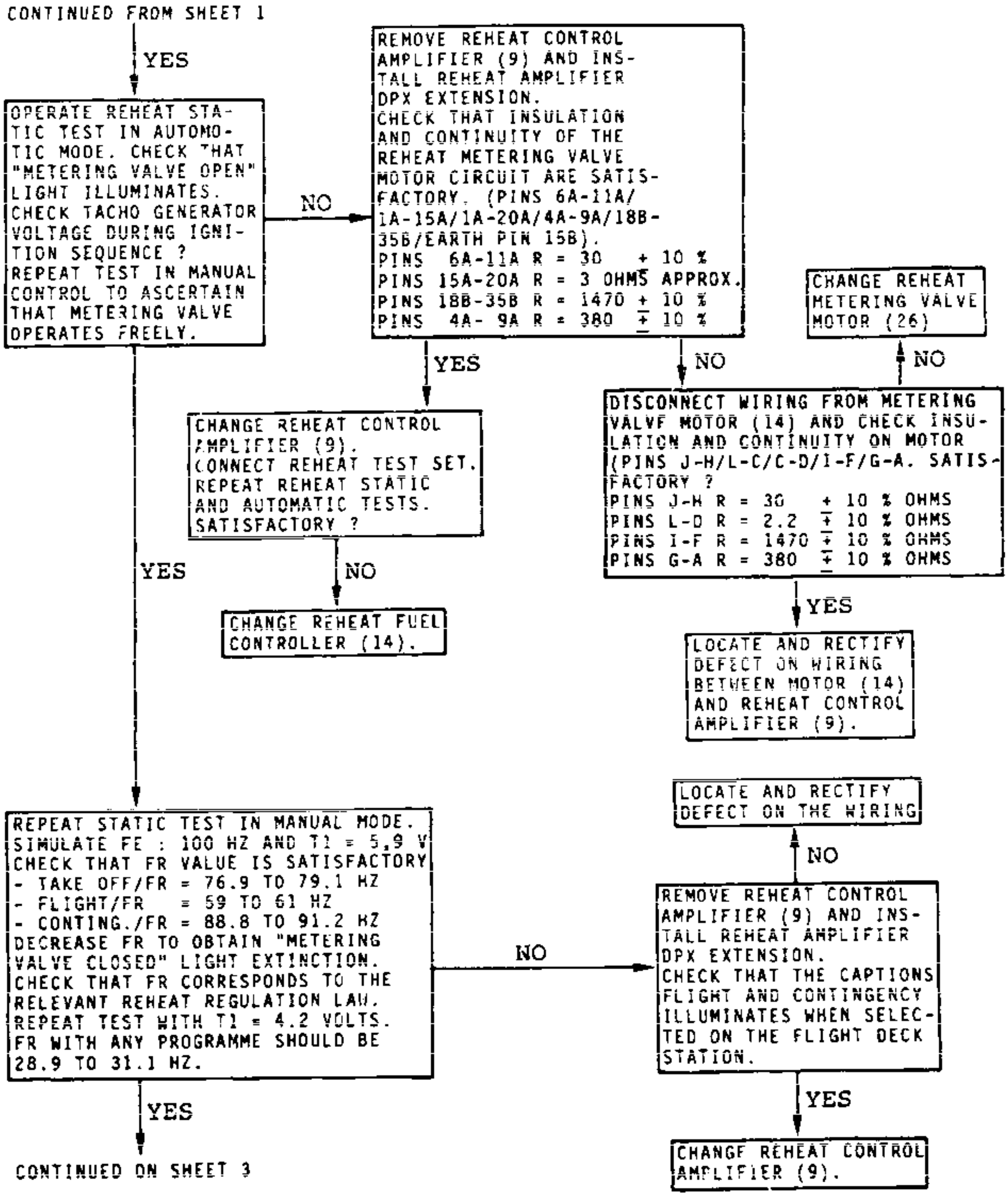
NO → TROUBLE-SHOOT FUEL FLOW INDICATION SYSTEM. REF. 71-00-33-CHART 107.

YES ↓

CONTINUED ON SHEET 2

CMS 71 00 49 1 LAMA

Chart 111 (Sheet 1 of 5)



CMS 71 00 49 1 LAMB

Chart 111 (Sheet 2 of 5)

CONTINUED FROM SHEET 2

CR 36556/00A

R
R
R
R

SELECT TEST SET TO DYN.
SWITCH Tt1 OFF.
SELECT ENGINE CONTROL AMPLIFIER ON MAIN AND ALTERNATE AND READ VOLTAGE ON TEST SET. VALUE SHOULD BE:
5 VOLT APPROX. FOR T1 = 15 DEG. C
4.8 VOLT APPROX. FOR T1 = 40 DEG. C
5.4 VOLT APPROX. FOR T1 = -30 DEG. C
SATISFACTORY?

NO → TROUBLESHOOT TI SYSTEM. REFER TO 71-00-57 CHARTS 105 AND 105A

YES ↓

REMOVE REHEAT CONTROL AMPLIFIER (9) AND INSTALL REHEAT AMPLIFIER DPX EXTENSION.
CHECK FE FLOWMETER CIRCUIT FOR INSULATION AND CONTINUITY (PINS 23B-24B). IS SATISFACTORY
R= 1.4 TO 2.6 K.OHMS.

NO → DISCONNECT WIRING FROM FE FLOWMETER. CHECK THAT FLOWMETER (21) COIL INSULATION AND CONTINUITY (PINS H-G) ARE SATISFACTORY.
R=1.4 TO 2.6 K.OHMS.

NO → CHANGE FE FLOWMETER (21)

YES → LOCATE AND RECTIFY DEFECT ON WIRING BETWEEN FR FLOWMETER (21) AND REHEAT CONTROL AMPLIFIER (9).

CMS 71 00 49 1 LAMC

CHECK FR FLOWMETER CIRCUIT FOR INSULATION AND CONTINUITY (PINS 6B-7B). IS SATISFACTORY?
R= 1.4 TO 2.6 K.OHMS.

NO → DISCONNECT WIRING FROM FR FLOWMETER (22) COIL CHECK THAT INSULATION AND CONTINUITY (PINS H-G) ARE SATISFACTORY.
R=1.4 TO 2.6 K.OHMS

NO → CHANGE FR FLOWMETER (22)

YES → LOCATE AND RECTIFY DEFECT ON WIRING BETWEEN FE FLOWMETER (22) AND REHEAT CONTROL AMPLIFIER (9).

YES ↓

CHANGE FE FLOWMETER (21)AND FR FLOWMETER (22).
NOTE : OPERATION OF THE FLOWMETER IMPELLER IS SUSPECTED. IF THE FE FLOWMETER IMPELLER IS SUSPECT, FT WILL BE LOW ASSOCIATED WITH A LOW AJ.

NO → CHANGE REHEAT CONTROL AMPLIFIER (9)

Chart 111 (Sheet 3 of 5)

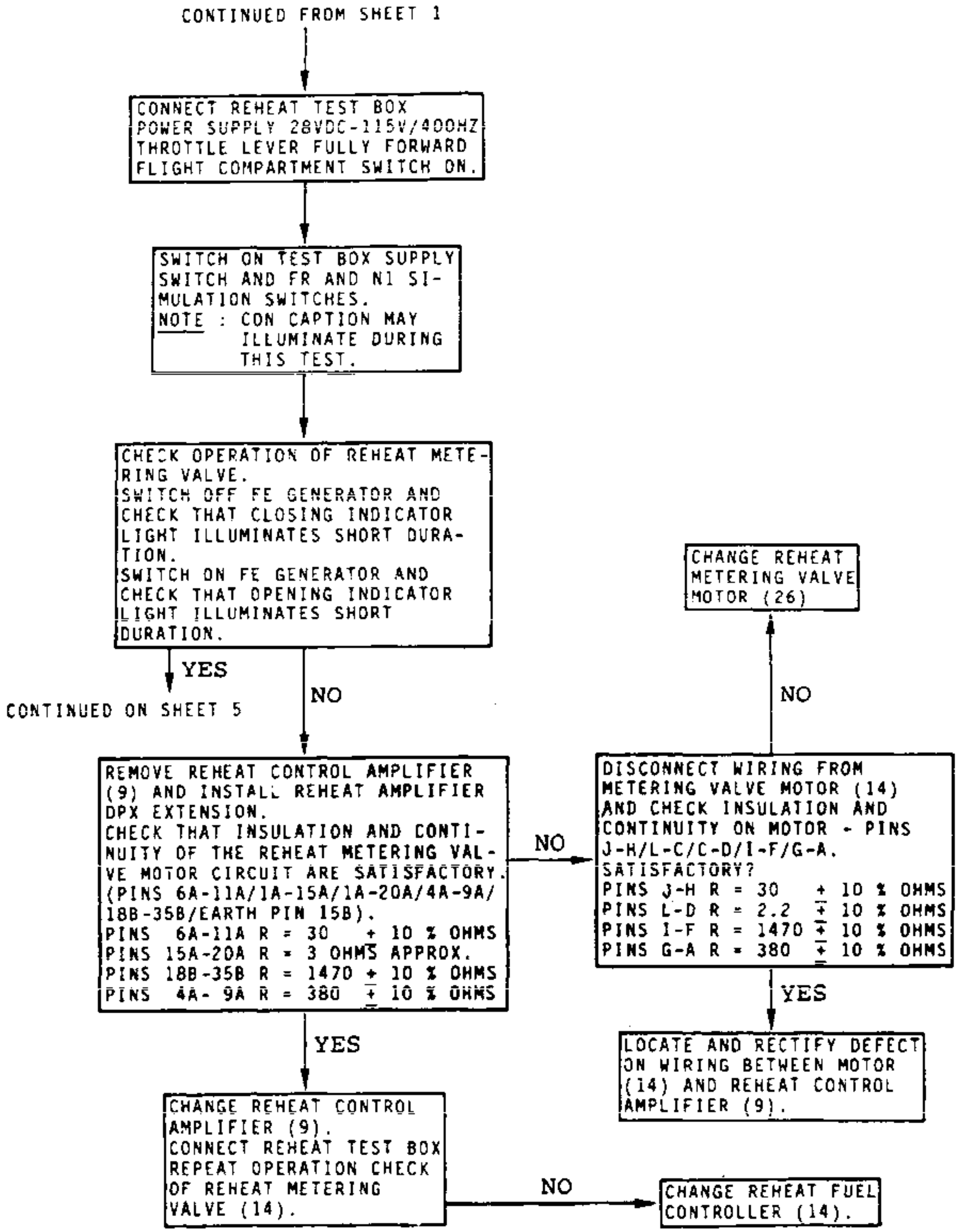
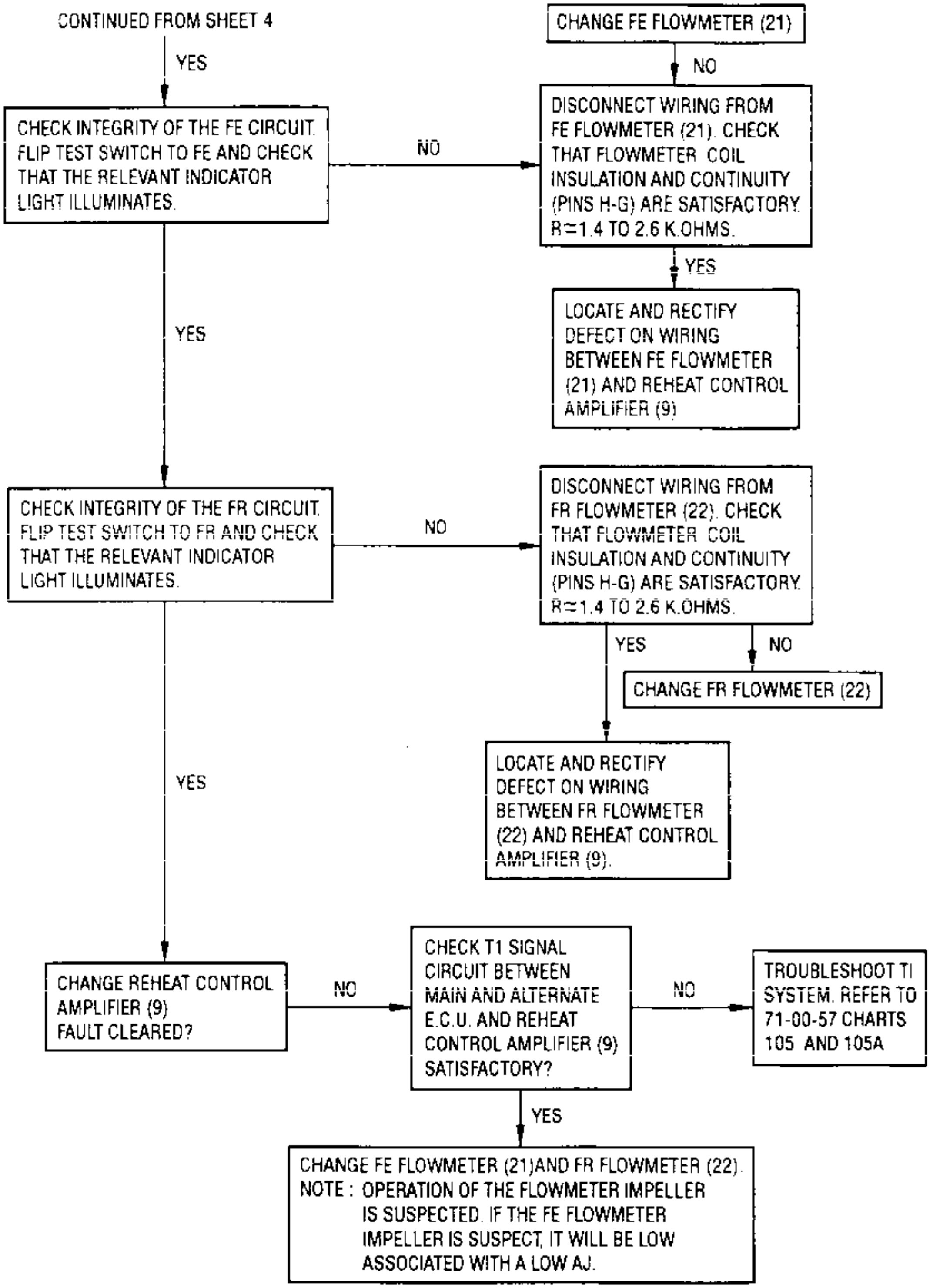


Chart 111 (Sheet 4 of 5)

CR 36557/00A



R
R
R
R

CMS 71 00 49 1 LAMC

Chart 111 (Sheet 5 of 5)

EFFECTIVITY: ALL

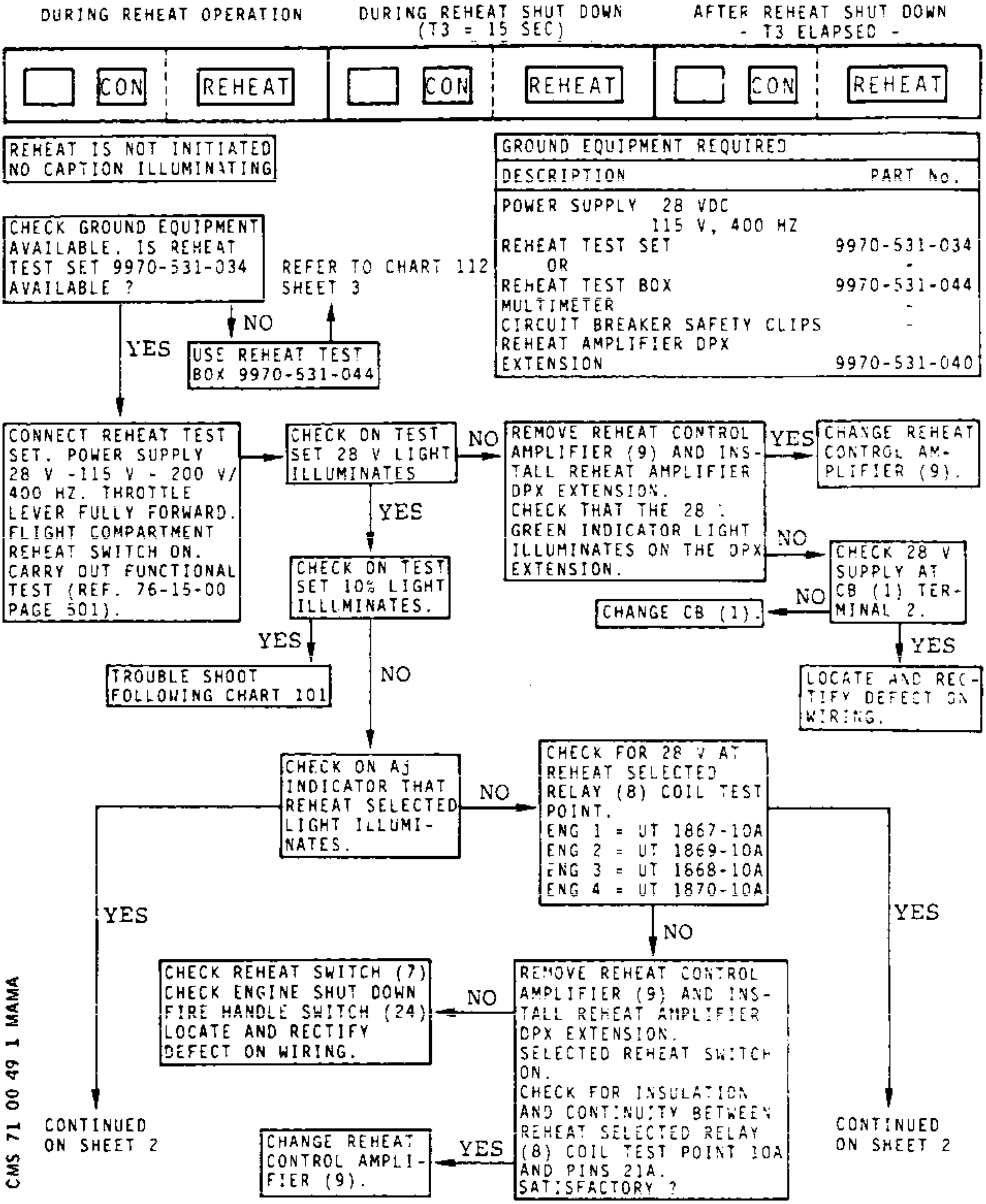
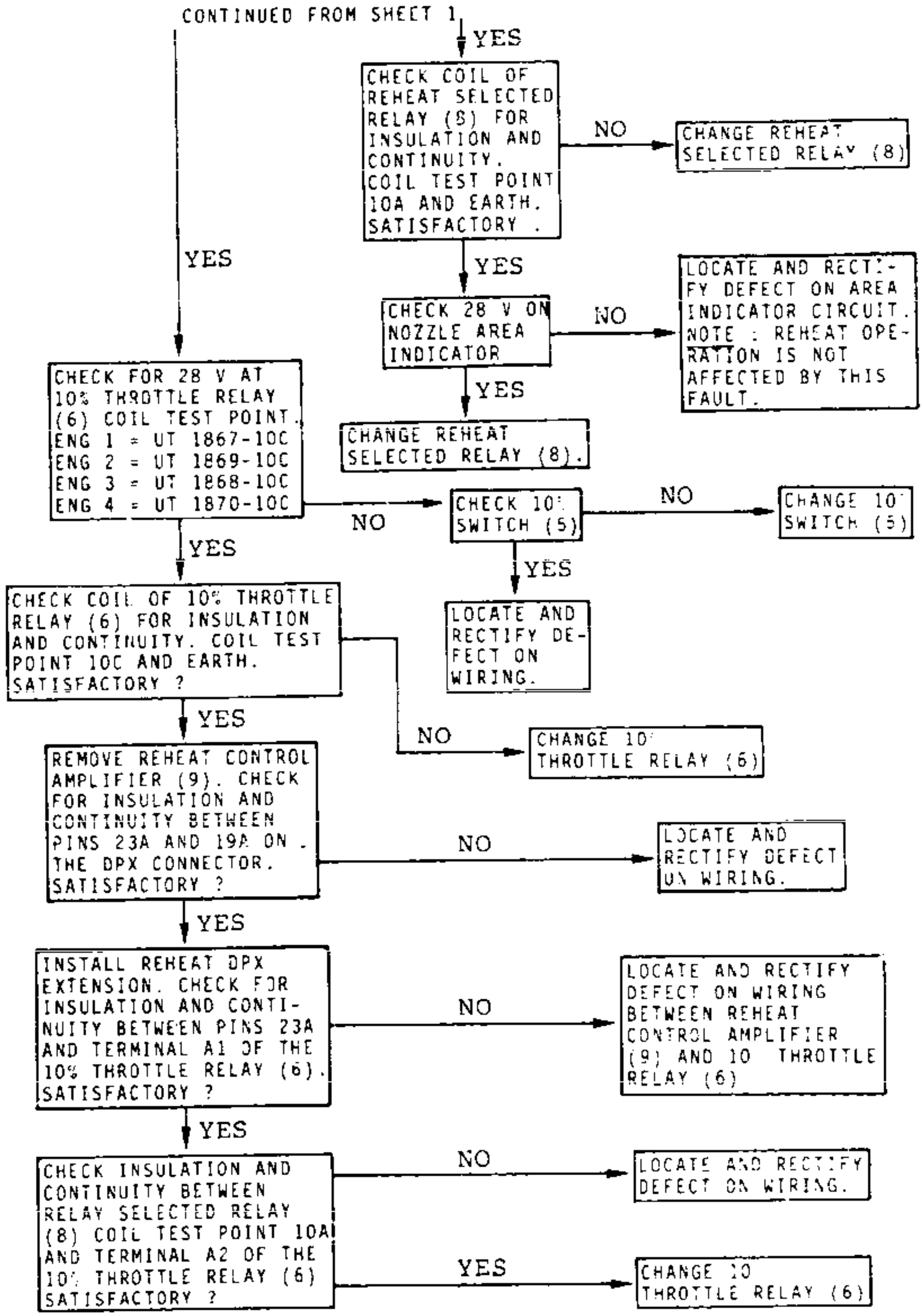


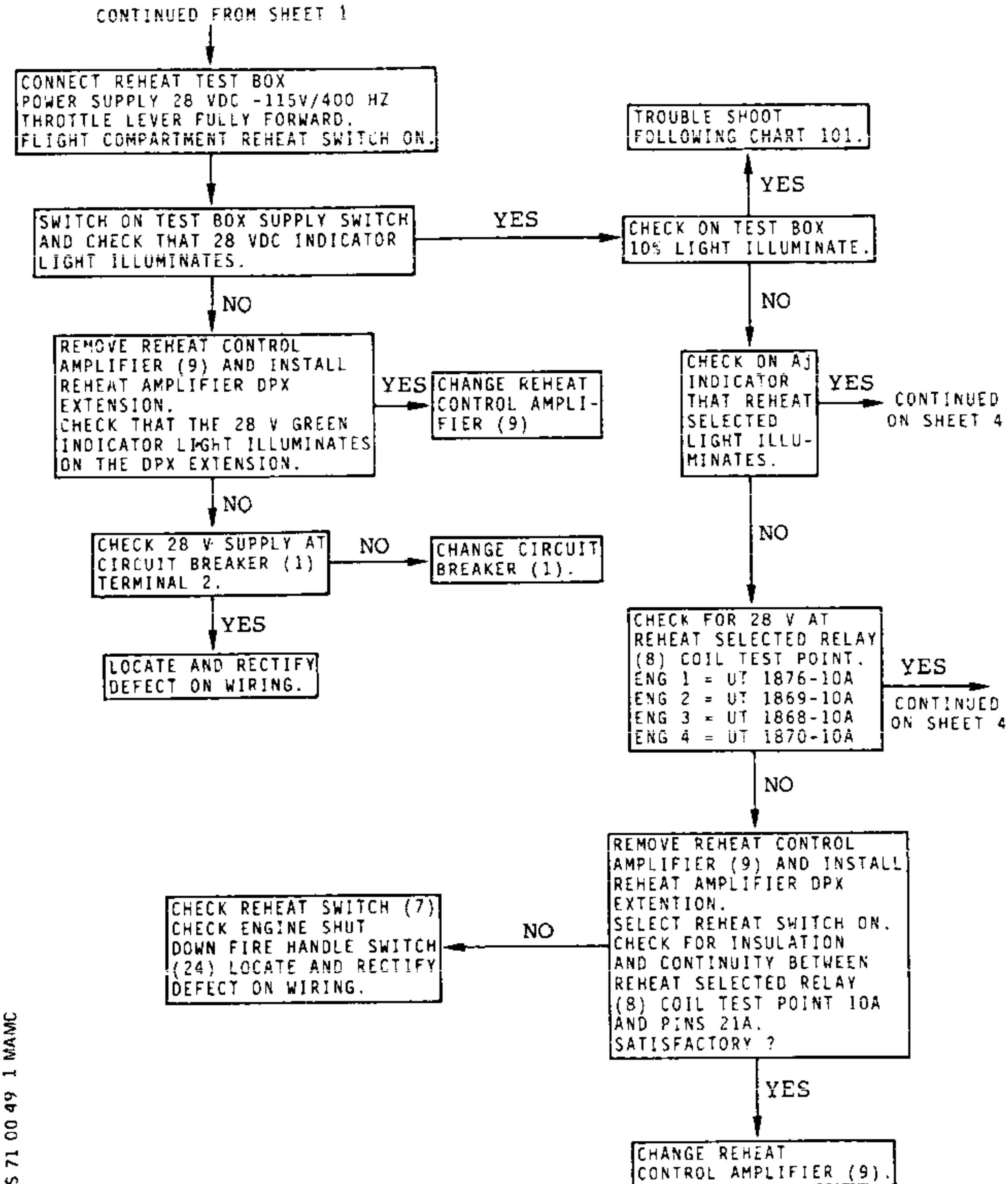
Chart 112 (Sheet 1 of 4)

CMS 71 00 49 1 MAMA



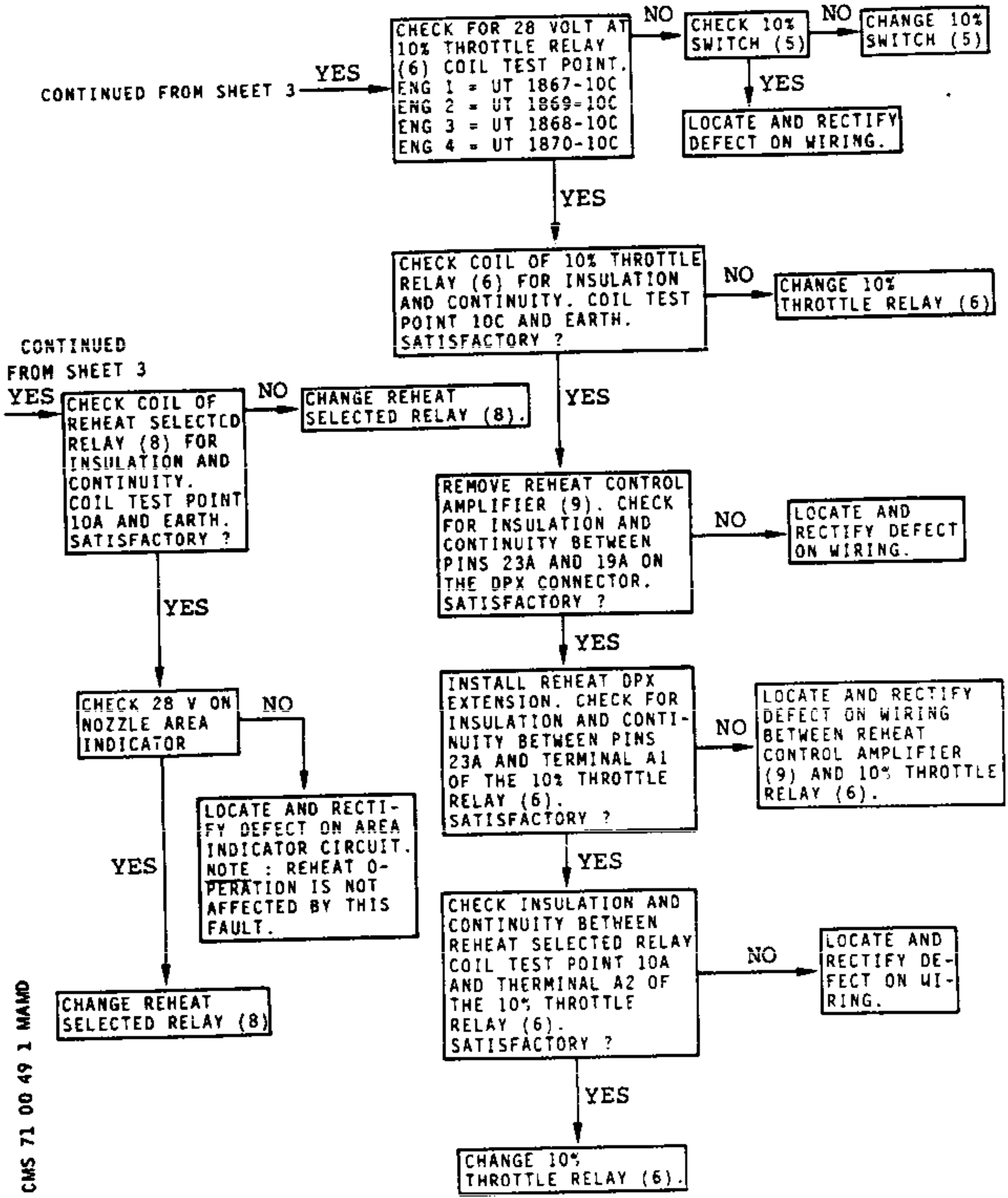
CMS 71 00 49 1 MAMB

Chart 112 (Sheet 2 of 4)



CMS 71 00 49 1 MAMC

Chart 112 (Sheet 3 of 4)



CMS 71 00 49 1 MAMD

Chart 112 (Sheet 4 of 4)

ITEM DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	WIRING DIAGRAM
ENGINE No. 1						
1. Circuit Breaker 28 V (REHEAT CON).		15-216	1K1542	E 9	24-50-00	76-15-51
2. Circuit Breaker 115 V (REHEAT AMP SUP).		14-215	1K1541	C12	24-50-00	76-15-51
3. Circuit Breaker 200 V (REHEAT IGN SUP PH C).		14-215	1K1544	F12	24-50-00	76-15-81
4. Circuit Breaker 21) 200V (REHEAT IGN SUP PH A).		14-215	1K1543	B13	24-50-00	76-15-81
5. Forward thrust throttle switch pack.		9-211	1K1548		76-15-12	76-15-51
6. 10% throttle lever relay		19-123	1K 727		76-00-00	76-15-51
7. Reheat selector.		9-211	1K1547			76-15-51
8. Reheat selector relay.		19-123	1K1565		76-00-00	76-15-51

ITEM DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	WIRING DIAGRAM
9. Reheat control amplifier		3-243	1K1553		76-15-11	76-15-51

ITEM DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	WIRING DIAGRAM
10. Reheat ignition safety relay		7-243	1K1550		76-00-00	76-15-81
11. Reheat ignition control relay.		7-243	1K1551		76-00-00	76-15-81
12. Reheat ignition transformer.		416	1K1560		74-12-11	76-15-81
13. Reheat igniter.		415	1K1561		74-22-01	76-15-81
14. Reheat fuel controller.		415	1K1555		73-23-01	76-15-11
15. SOVS (Shut-off valve solenoid).		415	1K1555-A		73-23-01	76-15-11
16. Purge valve transducer.		415	1K1555-C		73-23-02	76-15-11
17. Purge solenoid valve		415	1K1554		73-24-01	76-15-11
18. LP compressor RPM probe.		415	1E 153		76-12-01	77-11-11
19. Reheat detection pressure switch.		415	1K1563		76-15-03	76-15-11
20. Fuel flow indicator.		6-211	1E 476		73-33-11	73-33-12
21. Engine fuel flowmeter.		413	1E 477		73-33-01	73-33-12
22. Reheat fuel flowmeter.		413	1E 478		73-33-02	77-33-12
23. Reheat detec-		415	1K1559		76-15-02	76-15-12

ITEM DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	WIRING DIAGRAM
tor (ionisation).						
24. Engine shut-down handle switch.		4-211	1W 160		26-22-00	26-22-00
25. Capacitor.		7-243	1K1552		76-00-00	76-15-81
26. Reheat metering valve motor.		415	1K1555B		73-23-03	76-15-11
27. Circuit-Breaker LH UC WEIGHT SW		3-213	G 293	B 8		
28. Circuit-Breaker RH UC WEIGHT SW		1-213	G 295	M18		
ENGINE NO. 2						
1. Circuit Breaker 28 V (REHEAT CONT).		15-215	2K1542	D15	24-50-00	76-15-53
2. Circuit Breaker 115 V (REHEAT AMP SUP).		13-215	2K1541	B14	24-50-00	76-15-53
3. Circuit Breaker 200 V (REHEAT IGN SUP PH C).		13-215	2K1544	E14	24-50-00	76-15-82
4. Circuit Breaker 200 V (REHEAT IGN SUP PH A).		13-215	2K1543	A14	24-50-00	76-15-82
5. Forward thrust throttle switch pack.		9-211	2K1548		76-15-12	76-15-53

ITEM DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
6. 10% throttle lever relay.		19-123	2K 727		76-00-00	76-15-53
7. Reheat selector.		9-211	2K1547			76-15-53
8. Reheat selector relay.		19-123	2K1565		76-00-00	76-15-53
9. Reheat control amplifier		4-243	2K1553		76-15-11	76-15-53
10. Reheat ignition safety relay.		4-243	2K1550		76-00-00	76-15-82
11. Reheat ignition control relay		4-243	2K1551		76-00-00	76-15-82
12. Reheat ignition transformer.		425	2K1560		74-12-11	76-15-82
13. Reheat igniter.		425	2K1561		74-22-01	76-15-82
14. Reheat fuel controller.		425	2K1555		73-23-01	76-15-21
15. SOVS (Shut-off valve solenoid.		425	2K1555-A		73-23-01	76-15-21
16. Purge valve transducer.		425	2K1555-C		73-23-02	76-15-21
17. Purge solenoid valve.		425	2K1554		73-24-01	76-15-21
18. LP compressor RPM probe.		425	2E 153		76-12-01	77-11-11
19. Reheat detection pressure switch.		426	2K1563		76-15-03	76-15-21

ITEM DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	WIRING DIAGRAM
20. Fuel flow indicator.		6-211	2E 476		73-33-11	77-33-13
21. Engine fuel flowmeter.		423	2E 477		73-33-01	77-33-13
22. Reheat fuel flowmeter.		423	2E 478		73-33-02	77-33-13
23. Reheat detector (ionisation).		425	2K1559		76-15-02	76-15-22
24. Engine shutdown handle switch.		4-211	2W 160		26-22-00	26-22-00
25. Capacitor		4-243	2K1552		76-00-00	76-15-82
26. Reheat Metering valve motor.		425	2K1555B		73-23-03	76-15-21
27. Circuit Breaker LH UC WEIGHT SW		3-213	G 293	B 8		
28. Circuit Breaker RH UC WEIGHT SW		1-213	G 295	M18		
ENGINE NO. 3						
1. Circuit Breaker 28 V (REHEAT CON).		15-215	3K1542	D16	24-50-00	76-15-55
2. Circuit Breaker 115 V (REHEAT AMP SUP).		13-216	3K1541	B 7	24-50-00	76-15-55
3. Circuit Breaker 200 V (REHEAT IGN		13-216	3K1544	F 6	24-50-00	76-15-83

ITEM DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
SUP PH C).						
4. Circuit Breaker 200 V (REHEAT IGN SUP PH A).		13-216	3K1543	A 5	24-50-00	76-15-83
5. Forward thrust throttle switch pack.		9-211	3K1548		76-15-12	76-15-55
6. 10% throttle lever relay.		20-123	3K 727		76-00-00	76-15-55
7. Reheat selector.		9-211	3K1547			76-15-55
8. Reheat selector relay.		20-123	3K1565		76-00-00	76-15-55
9. Reheat control amplifier.		4-244	3K1553		76-15-11	76-15-55
10. Reheat ignition safety relay.		4-244	3K1550		76-00-00	76-15-83
11. Reheat ignition control relay		4-244	3K1551		76-00-00	76-15-83
12. Reheat ignition transformer.		436	3K1560		74-12-11	76-15-83
13. Reheat igniter.		435	3K1561		74-22-01	76-15-83
14. Reheat fuel controller.		435	3K1555		73-23-01	76-15-31
15. SOVS (Shut-off valve solenoid).		435	3K1555-A		73-23-01	76-15-31

ITEM DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
16.Purge valve transducer.		435	3K1555-C		73-23-02	76-15-31
17.Purge solenoid valve.		435	3K1554		73-24-01	76-15-31
18.LP compressor RPM probe.		435	3E 153		76-12-01	77-11-11
19.Reheat detection pressure switch.		435	3K1563		76-15-03	76-15-31
20.Fuel flow indicator.		6-211	3E 476		73-33-11	73-33-21
21.Engine fuel flowmeter.		433	E 477		73-33-01	73-33-21
22.Reheat fuel flowmeter.		433	E 478		73-33-02	73-33-21
23.Reheat detector (ionisation).		435	K1559		76-15-02	76-15-32
24.Engine shutdown handle switch.		4-211	3W 160		26-22-00	26-22-00
25.Capacitor		4-244	3K1552		76-00-00	76-15-31
26.Reheat metering valve motor.		435	3K1555B		73-23-03	76-15-31
27.Circuit-Breaker LH UC WEIGHT SW		3-213	G 293	B 8		
28.Circuit-Breaker RH UC WEIGHT SW		1-213	G 295	M18		

ENGINE NO. 4

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ITEM DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
1. Circuit Breaker 28 V (REHEAT CON).		15-216	4K1542	E10	24-50-00	76-15-57
2. Circuit Breaker 115 V (REHEAT AMP SUP).		14-216	4K1541	D 7	24-50-00	76-15-57
3. Circuit Breaker 200 V (REHEAT IGN SUP PH C).		14-216	4K1544	E 7	24-50-00	76-15-84
4. Circuit Breaker 200 V (REHEAT IGN SUP PH C).		14-216	4K1543	A 6	24-50-00	76-15-84
5. Forward thrust throttle switch pack.		9-211	4K1548		76-15-12	76-15-57
6. 10% throttle lever relay.		20-123	4K 727		76-00-00	76-15-57
7. Reheat selector.		9-211	4K1547			76-15-57
8. Reheat selector relay.		20-123	4K1565		76-00-00	76-15-57
9. Reheat control amplifier.		6-244	4K1553		76-15-11	76-15-57
10. Reheat ignition safety relay.		7-244	4K1550		76-00-00	76-15-84
11. Reheat ignition control relay.		7-244	4K1551		76-00-00	76-15-84
12. Reheat ignition trans-		445	4K1560		74-12-11	76-15-84

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ITEM DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
former.						
13. Reheat igniter		445	4K1561		74-22-01	76-15-84
14. Reheat fuel controller.		445	4K1555		73-23-01	76-15-41
15. SOVS (Shut-off valve solenoid).		445	4K1555-A		73-23-01	76-15-41
16. Purge valve transducer.		445	4K1555-C		73-23-02	76-15-41
17. Purge solenoid.		445	4K1554		73-24-01	76-15-41
18. LP compressor RPM probe.		445	4E 153		76-12-01	77-11-11
19. Reheat detection pressure switch.		446	4K1563		76-15-03	76-15-41
20. Fuel flow indicator.		6-211	4E 476		73-33-11	77-33-22
21. Engine fuel flowmeter.		443	4E 477		73-33-01	77-33-22
22. Reheat fuel flowmeter.		443	4E 478		73-33-02	77-33-22
23. Reheat detector (ionisation).		445	4K1559		76-15-02	76-15-42
24. Engine shutdown handle switch.		4-211	4W 160		26-22-00	26-22-00
25. Capacitor.		7-244	4K1552		76-00-00	76-15-84
26. Reheat metering valve motor.		445	4K1555B		73-23-03	76-15-41

ITEM DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
27. Circuit-Breaker LH UC WEIGHT SW		3-213	G 293	B 8		
28. Circuit-Breaker RH UC WEIGHT SW		1-213	G 295	M18		

Component Identification
Table 103

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STARTING (CRANKING) - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. para.3.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

The four engine starting (cranking) circuits are similar, therefore the procedures and charts are applicable to all four. Where identical components are involved, that is, one in each circuit, all references to the associated components listed in Table 101 are given, for example, 'Renew Circuit Breaker (1), (2), (3) or (4)'.

2. Preparation

A. Ensure that the associated circuit breakers are set (Ref. Table 101, items (1) to (14) inclusive).

B. Make available electrical ground power as detailed in 24-41-00.

C. Ensure that a suitable ground air supply is connected to the ground air connector for the appropriate pair of engines (Ref. 71-00-00, Adjustment/Test).

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D. Test the debowing control switch light filaments as detailed in 33-14-00.

3. Trouble Shooting

```
A.*****************************************
  *Prepare to trouble shoot (Ref. para.2.).*
  *Check that with the debowing control    *
  *switch set to NORMAL, the debow light   *
  *is out, and with the switch set to      *
  *DEBOW, the light comes on. IF -         *
  ******************************************
             |    |
             |    |        -----------------------------------
             |    |       |1. Debow light on when debowing   |
             OK   NOT OK--|   control switch at NORMAL -     |
             |            |   renew Switch (19),(20),(21) or |
             |            |   (22).                          |
             |            |2. Debow light out with control   |
             |            |   switch set to DEBOW -          |
             |            |   Chart 101.                     |
             |             -----------------------------------

             |
B.*****************************************
  *Check that with the debowing control    *
  *switch set to DEBOW, the ignition       *
  *control switch holds in when set to     *
  *START, the air start valve magnetic     *
  *position indicator moves to OPEN, (the  *
  *debow light goes out) and the START     *
  *PUMP caption on panel 1-214 is illumin- *
  *ated.  IF -                             *
  ******************************************
             |    |
             |    |        -----------------------------------
             |    |       |1. Ignition control switch does   |
             OK   NOT OK--|   not hold in when set to START -|
             |            |   Chart 102.                     |
             |            |2. Air start valve magnetic       |
             |            |   indicator does not move to OPEN|
             |            |   - Chart 103.                   |
             |            |3. START PUMP caption not illumin-|
             |            |   ated - Chart 104.              |
             |             -----------------------------------
```

```
                |
C.*******************************************
  *Check that the engine commences to       *
  *rotate, then achieves start speed of     *
  *16 per cent N2, in 25 s.  IF -           *
  *******************************************
                |    |
                |    |                  ----------------------------------
                |    |                 |Engine fails to rotate, or does   |
               OK   NOT OK-------------|not attain start speed of 16 per  |
                |                      |cent N2 in 25 s - Chart 105.      |
                |                       ----------------------------------
                |
D.*******************************************
  *Check that at approx. 30 per cent N2 rpm*
  *the start switch returns to the centre- *
  *off position, followed by the start     *
  *valve magnetic indicator moving to      *
  *SHUT.  IF -                             *
  *******************************************
                |    |
                |    |                  ----------------------------------
                |    |                 |Renew Engine Speed Unit (45)      |
               OK   NOT OK-------------|(Ref. 24-22-22).                  |
                |                       ----------------------------------
                |
E.*******************************************
  *Check that after approx. 60 s the debow *
  *light comes on.  IF -                   *
  *******************************************
                |    |
                |    |                  ----------------------------------
                |    |                 |Debow light does not come on      |
               OK   NOT OK-------------|approx. 60 s after start switch   |
                |                      |returns to centre-off position -  |
                |                      |renew Relay (23),(24),(25) or (26)|
                |                       ----------------------------------
                |
```

F. Set the DEBOW switch to "NORMAL"; check that the engine accelerates to slow running (approx. 62 per cent HP rpm), then after approx. 30 s the START PUMP caption is extinguished. IF -

NOT OK

1. Engine does not accelerate to slow running speed - trouble shoot Engine Power Control system (Ref. 71-00-48).
2. START PUMP caption is not extinguished - Chart 106.

```
*******************************
*DEBOW LIGHT OUT WITH CONTROL *
*SWITCH AT "DEBOW".           *
*******************************
```

GROUND EQUIPMENT REQUIRED

DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the preceding run of wiring for continuity.

```
 ----------     ----------                                   -------------
|Set debow-|   |Does Mag- |                                 |Locate and     |
|ing con-  |---|netic In- |                                 |rectify        |
|trol      |   |dicator   |        --------------           |wiring fault   |
|switch to |   |(27),(28),|       |Remove Relay  |          |between Relay|
|"DEBOW"   |   |(29) or   |-YES-|(23),(24),(25)|-NO-|(15),(16),     |
|and igni- |   |(30) show |       |or (26) and   |          |(17 or (18)    |
|tion con- |   |OPEN?     |       |check for 28 V|          |and Relay      |
|trol      |    ----------        |d.c. at con-  |          |(23),(24),     |
|switch to |        |             |tact D2 of re-|          |(25) or (26).|
|"START".  |        NO            |lay socket.   |--         -------------
 ----------         |              --------------   |
               -----------               |          |
              |Set ignition|             NO         |      -------------
              |control     |             |        YES-|*Renew Relay  |
              |switch to   |       ---------------       |(23),(24),    |
              |"OFF" and   |      |Remove Relay   |      |(25) or (26).|
              |check for   |      |(15),(16),(17),|      |Is fault      |
              |28 V d.c.   |      |(18) and bridge|      |cleared?      |
              |output from |      |contacts B2 and|       -------------
              |terminal    |      |B3 on the relay|            |
              |2 of CB (1) |      |socket with a  |            NO
              |or (2).     |-YES|jumper lead.   |            |
               ------------       |Is debow       |      -------------
                    |             |light on?      |     |*Renew Debow-  |
                    NO             ---------------      |ing Control    |
                    |                     |             |Switch (19),   |
               ------------               YES           |(20),(21) or   |
              |Renew CB    |              |             |(22).          |
              |(1) or (2). |        ------------         -------------
               ------------        |*Renew Relay |
                                   |(15),(16),   |
                                   |(17) or (18).|
                                    ------------
```

Chart 101

```
**********************************       ------------------------------
*IGNITION CONTROL SWITCH DOES *          |GROUND EQUIPMENT REQUIRED     |
*NOT HOLD ON WHEN SET TO      *          |------------------------------|
*"START".                     *          |DESCRIPTION         PART NO.  |
**********************************       |------------------------------|
                                         |GROUND POWER SUPPLY  -        |
                                         |MULTIMETER           -        |
                                          ------------------------------
```

NOTE: Before renewal of components (*), check the preceding run of wiring for continuity.

```
 ----------      ----------       ---------------         ----------
|Set debow-|    |Does Mag- |     |Check for 28 V |       |*Renew    |
|ing cont- |----|netic Ind-|-NO--|d.c. at test---|       |Ignition  |
|rol switch|    |icator    |     |point 7-123,   |       |Control   |
|to "DEBOW"|    |(27),(28),|     |UT1891-C1,7-123,|      |Switch (31)|
|and igni- |    |(29) or   |     |UT1893-C1,8-123,|      |or (32).  |
|tion      |    |(30) show |     |UT1890-C1 or   |        ----------
|control   |    |OPEN?     |     |8-123,UT1892-C1.|--          |
|switch to |     ----------       ---------------   |         YES
|"START".  |         |                  |           |          |
 ----------         YES                YES          |      ----------
                     |                  |           NO-|Check for |
                 ----------       ---------------      |28 V d.c. |
                |*Renew    |     |Check for earth|     |at terminal|
                |Ignition  |-YES-|at test point  |     |2 of CB   |
                |Control   |     |7-123,UT1891-D1,|    |(7), (8), |
                |Switch    |     |7-123,UT1893-D1,|    |(9) or    |
                |(31) or   |     |8-123,UT1890-D1,|    |(10).     |
                |(32).     |     |or 8-123,      |      ----------
                 ----------      |UT1892-D1.     |          |
                                  ---------------          NO
                                        |                   |
                                       NO               ----------
                                        |              |Renew CB  |
                                 ---------------       |(7),(8),  |
                                |*Renew Engine  |      |(9) or (10)|
                                |Speed Unit (45).|      ----------
                                |Is fault cleared?|
                                  ---------------
                                        |
                                       NO
                                        |
                           ------------------------------
                          |*Renew Debowing Control       |
                          |Switch (19),(20),(21) or (22).|
                           ------------------------------
```

Chart 102

```
********************************          ------------------------------
*AIR START VALVE MAGNETIC      *         |GROUND EQUIPMENT REQUIRED     |
*POSITION DOES NOT MOVE TO     *         |------------------------------|
*"OPEN".                       *         |DESCRIPTION          PART NO. |
********************************         |------------------------------|
                                         |GROUND POWER SUPPLY  -        |
                                         |MULTIMETER           -        |
                                          ------------------------------
```

NOTE: Before renewal of components (*), check the preceding run of wiring for continuity.

```
 -----------------         -----------------         ----------------
|With debowing    |       |Check for 28 V   |       |Renew CB (3),(4),|
|control switch   |-YES-  |d.c. from terminal|-NO-  |(5) or (6).      |
|set to "DEBOW",  |       |2 of CB (3),(4), |        ----------------
|check that the   |       |(5) or (6).      |
|debow light goes |        -----------------
|out when the     |                |
|ignition control |               YES
|is set to START. |                |
 -----------------         ------------------
         |                |Check that the Air|
         NO               |Starter Control   |
         |                |Valve (37),(38),  |
 -----------------        |(39) or (40) is   |       -----------------
|*Renew Air Start |       |open.             |-NO-  |Renew Air Starter|
|Control Relay    |        -----------------        |Control Valve    |
|(15), (16),(17), |                |                |(37),(38),(39) or|
|or (18).         |               YES          ---  |(40).            |
 -----------------                 |            |    -----------------
                           -----------------    |
                          |Check for 28 V   |-NO
                          |d.c. at terminal |
                          |C of Magnetic Ind-|
                          |icator (27),(28),|
                          |(29) or (30).    |
                           -----------------
                                   |
                                  YES
                                   |
                           -----------------
                          |Renew Magnetic   |
                          |Indicator (27),  |
                          |(28),(29) or (30).|
                           -----------------
```

Chart 103

```
********************************
*"START PUMP" CAPTION NOT      *
*ILLUMINATED.                  *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

NOTE: Before renewal of components (*), check the preceding run of wiring for continuity.

```
 -----------        ------------       ------------
|Test START |      |Set debowing|     |Check that  |
|PUMP       |      |control     |     |debow light |
|caption    |-NO-  |switch to   |     |is out. If  |
|filaments  |      |"DEBOW" and |     |Debowing    |
|as detailed|      |ignition    |     |Control     |
|in 33-14-00|      |control     |     |Switch (19),|
|and rectify|      |switch to   |     |(20),(21) or|
|as         |      |"START".    |     |(22) sus-   |
|necessary  |       ------------      |pected,     |
|(Ref.      |                         |renew switch|
|73-10-00). |                         |Is fault    |
|Is fault   |                         |cleared?    |
|cleared?   |                          ------------
 -----------                                |
                                            NO
                                            |
          -------------         --------------         ----------
         |*Renew Relay |       |Remove Relay  |       |Trouble   |
         |(33),(34),   |       |(33),(34),(35)|       |shoot start|
         |(35 or (36). |-YES-  |or (36), and  |-NO-   |fuel pump |
          -------------        |bridge contacts|      |control   |
                               |A2 and C3 on  |       |system (Ref|
                               |the relay     |       |71-00-26).|
                               |socket with a |        ----------
                               |jumper lead.  |
                               |Is fault      |
                               |cleared?      |
                                --------------
```

Chart 104

****

*ENGINE FAILS TO ROTATE OR *
*DOES NOT ATTAIN START SPEED *
*OF 16 PER CENT N2 IN 25 s. *

****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
GROUND AIR SUPPLY	-
ADAPTER	PE 20785
UNIVERSAL DRIVE	PE 22056
TORQUE SPANNER	T2EM1992

Set debowing control switch to "DEBOW" and ignition control switch to "START".

Ensure that correct ground air supply (44 psi) is available. Does engine now rotate?

NO

Does Magnetic Indicator (27) (28),(29) or (30) show OPEN.

-YES- Perform manual rotation of engine (Ref. 72-09-01). Do not exceed 740 lbf in (8.362 mdaN) torque. Does engine rotate at turning torque of 300 lbf in (3.39 mdaN) or less?

-YES- Renew Air Starter (41),(42), (43) or (44).

NO (from Does Magnetic Indicator...)

Trouble shoot air starter control valve - Chart 103.

NO (from Perform manual rotation...)

Continued on Sheet 2

Chart 105 (Sheet 1 of 2)

Continued from Sheet 1

```
 --------------        --------------
|Remove front   |     |Renew          |
|Hydraulic Pump |-YES-|Hydraulic Pump |
|(46),(47),(49) |     |(46),(47),(49) |
|or (50). Is    |     |or (50). Is    |
|the torque-    |     |fault cleared? |
|turning figure |      --------------
|significantly  |             |
|reduced?       |             NO
 --------------               |
 --------------        --------------
|Engines 1 and  |--NO-|Remove IDG     |
|3.             |     |(52),(53),(54) |
 --------------       |or (55) and    |
 --------------       |recheck engine |
|Engines 2 and  |     |rotating       |
|4.             |     |torque. Is     |
 --------------       |torque-turning |
       |              |figure signif- |      -----------
       NO          |--|icantly        |-YES-|Renew IDG  |
       |           |  |reduced?       |     |(52),(53), |
 --------------    |   --------------       |(54 or     |
|If fault       |--NO         |             |(55). Is   |
|persists,      |             NO            |fault      |
|remove rear    |             |             |cleared?   |
|Hydraulic      |      --------------        -----------
|Pump (48) or   |     |Remove engine  |           |
|(51), and      |     |for invest-    |-----------NO
|recheck. Is    |     |igation (Ref.  |
|torque-turning |     |Chaps.71 and   |
|figure signif- |     |72).           |
|icantly        |      --------------
|reduced?       |
 --------------
       |
      YES
       |
 -------------
|Renew         |
|Hydraulic     |
|Pump (48) or  |
|(51).         |
 -------------
```

Chart 105 (Sheet 2 of 2)

```
********************************     ------------------------------
*WHEN DEBOW SWITCH IS SET TO   *    |GROUND EQUIPMENT REQUIRED     |
*"NORMAL", "START PUMP"        *    |------------------------------|
*CAPTION IS NOT EXTINGUISHED   *    |DESCRIPTION         PART NO.  |
*AFTER APPROX. 30 s.           *    |------------------------------|
********************************    |GROUND POWER SUPPLY  -        |
                                     ------------------------------

            -----------------         -----------------
           |Did the DEBOW    |       |Renew Debowing   |
           |light go out when|-YES-|(Start Fuel Pump)|
           |control switch   |       |Time-delay Relay |
           |was set to       |       |(33),(34),(35) or|
           |NORMAL?          |       |(36). Is fault   |
            -----------------        |cleared?         |
                    |                 -----------------
                   NO                         |
                    |                        NO
            -----------------                 |
           |Renew Debowing   |           -----------------
           |Control Switch   |          |Trouble shoot    |
           |Switch (19), (20)|          |start fuel pump  |
           |(21) or (22).    |          |control circuit  |
            -----------------           |(Ref. 71-00-26). |
                                         -----------------
```

Chart 106

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(1) Circuit breaker 28 V (Nos.1 and 4 engines)	-	15-215	K181	Map ref.C15	24-50-00 R/I	80-11-01
(2) Circuit breaker 28 V (Nos.2 and 3 engines)	-	15-216	K182	Map ref.D11	24-50-00 R/I	80-11-01
(3) Circuit breaker 28 V (No.1 engine)	-	15-216	1K183	Map ref.D9	24-50-00 R/I	80-11-01
(4) Circuit breaker 28 V (No.2 engine)	-	15-215	2K183	Map ref.C16	24-50-00 R/I	80-11-01
(5) Circuit breaker 28 V (No.3 engine)	-	15-215	3K183	Map ref.C17	24-50-00 R/I	80-11-01
(6) Circuit breaker 28 V (No.4 engine)	-	15-216	4K183	Map ref.D10	24-50-00 R/I	80-11-01
(7) Circuit breaker 28 V (No.1 engine)	-	3-213	1J1	Map ref.E1	24-50-00 R/I	74-00-01
(8) Circuit breaker 28 V (No.2 engine)	-	3-213	2J1	Map ref.E2	24-50-00 R/I	74-00-01
(9) Circuit breaker 28 V (No.3 engine)	-	3-213	3J1	Map ref.E3	24-50-00 R/I	74-00-01
(10) Circuit breaker 28 V (No.4 engine)	-	3-213	4J1	Map ref.E4	24-50-00 R/I	74-00-01
(11) Circuit breaker 28 V (No.1 engine)	-	1-213	1J2	Map ref.N6	24-50-00 R/I	74-00-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(12) Circuit breaker 28 V (No.2 engine)	-	1-213	2J2	Map ref.P6	24-50-00 R/I	74-00-01
(13) Circuit breaker 28 V (No.3 engine)	-	1-213	3J2	Map ref.Q6	24-50-00 R/I	74-00-01
(14) Circuit breaker 28 V (No.4 engine)	-	1-213	4J2	Map ref.R6	24-50-00 R/I	74-00-01
(15) No.1 engine air start control relay	-	7-123	1J18	LH misc. relay box	Chap.74	74-00-01
(16) No.2 engine air start control relay	-	7-123	2J18	LH misc. relay box	Chap.74	74-00-01
(17) No.3 engine air start control relay	-	8-123	3J18	RH misc. relay box	Chap.74	74-00-01
(18) No.4 engine air start control relay	-	8-123	4J18	RH misc. relay box	Chap.74	74-00-01
(19) No.1 engine debowing control switch	-	18-214	1K189	3CM station	80-11-00 R/I	80-11-01
(20) No.2 engine debowing control switch	-	18-214	2K189	3CM station	80-11-00 R/I	80-11-01
(21) No.3 engine debowing control switch	-	18-214	3K189	3CM station	80-11-00 R/I	80-11-01
(22) No.4	-	18-214	4K189	3CM station	80-11-00	80-11-01

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ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
engine debowing control switch					R/I	
(23) No.1 engine debowing time-delay relay	-	7-123	1K187	LH misc. relay box	80-11-00 R/I	80-11-01
(24) No.2 engine debowing time-delay relay	-	7-123	2K187	LH misc. relay box	80-11-00 R/I	80-11-01
(25) No.3 engine debowing time-delay relay	-	8-123	3K187	RH misc. relay box	80-11-00 R/I	80-11-01
(26) No.4 engine debowing time-delay relay	-	8-123	4K187	RH misc. relay box	80-11-00 R/I	80-11-01
(27) No.1 engine start valve magnetic position indicator	-	18-214	1K184	3CM station	80-11-00 R/I	80-11-01
(28) No.2 engine start valve magnetic position indicator	-	18-214	2K184	3CM station	80-11-00 R/I	80-11-01
(29) No.3 engine start valve magnetic position indicator	-	18-214	3K184	3CM station	80-11-00 R/I	80-11-01
(30) No.4 engine start valve magnetic position	-	18-214	4K184	3CM station	80-11-00 R/I	80-11-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
indicator						
(31) Nos.1 and 2 engines ignition control switches	-	18-214	J5	3CM station	-	74-00-01
(32) Nos.3 and 4 engines ignition control switches	-	18-214	J28	3CM station	-	74-00-01
(33) No.1 engine debowing (start fuel pump) time-delay relay	-	7-123	1K186	LH misc. relay box	80-11-00 R/I	80-11-01
(34) No.2 engine debowing (start fuel pump) time-delay relay	-	7-123	2K186	LH misc. relay box	80-11-00 R/I	80-11-01
(35) No.3 engine debowing (start fuel pump) time-delay relay	-	8-123	3K186	RH misc. relay box	80-11-00 R/I	80-11-01
(36) No.4 engine debowing (start fuel pump) time-delay relay	-	8-123	4K186	RH misc. relay box	80-11-00 R/I	80-11-01
(37) No.1 engine air starter control valve	-	415	K185	No.1 engine air starter	80-11-12 R/I	80-11-01
(38) No.2 engine air starter control valve	-	426	K185	No.2 engine air starter	80-11-12 R/I	80-11-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(39) No.3 engine air starter control valve	-	435	K185	No.3 engine air starter	80-11-12 R/I	80-11-01
(40) No.4 engine air starter control valve	-	446	K185	No.4 engine air starter	80-11-12 R/I	80-11-01
(41) No.1 engine air starter	-	415	-	No.1 engine RH acces- sory gearbox	80-11-11 R/I	-
(42) No.2 engine air starter	-	426	-	No.2 engine RH acces- sory gearbox	80-11-11 R/I	-
(43) No.3 engine air starter	-	435	-	No.3 engine RH acces- sory gearbox	80-11-11 R/I	-
(44) No.4 engine air starter	-	446	-	No.4 engine RH acces- sory gearbox	80-11-11 R/I	-
(45) Engine speed unit	-	1-215	X223	Flt. compt. LH racking	24-22-22 R/I	-
(46) No.1 engine green hydraulic pump	-	415	-	No.1 engine RH acces- sory gearbox	29-11-71 R/I	-
(47) No.2 engine green (front) hydraulic pump	-	426	-	No.2 engine RH acces- sory gearbox	29-11-71 R/I	-
(48) No.2	-	426	-	No.2 engine	29-21-71	-

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
engine yellow (rear) hydraulic pump				RH acces- sory gearbox	R/I	
(49) No.3 engine blue (front) hydraulic pump	-	435	-	No.3 engine RH acces- sory gearbox	29-12-71 R/I	-
(50) No.4 engine blue (front) hydraulic pump	-	446	-	No.4 engine RH acces- sory gearbox	29-12-71 R/I	-
(51) No.4 engine yellow (rear) hydraulic pump	-	446	-	No.4 engine RH acces- sory gearbox	29-21-71 R/I	-
(52) No.1 engine IDG	-	415	1X1	No.1 engine RH acces- sory gearbox	24-11-11 R/I	-
(53) No.2 engine IDG	-	426	2X1	No.2 engine RH acces- sory gearbox	24-11-11 R/I	-
(54) No.3 engine IDG	-	435	3X1	No.3 engine RH acces- sory gearbox	24-11-11 R/I	-
(55) No.4 engine IDG	-	446	4X1	No.4 engine RH acces- sory gearbox	24-11-11 R/I	-

Component Identification

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM

Table 101

BUCKET CONTROL SYSTEM - TROUBLE SHOOTING

1. General

Faults are dealt with on a probability basis and identified as a result of testing. They also develop on the ground or during flight.

The defect can be isolated with the aid of the trouble shooting procedures (Ref. para 3), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK. An index of Trouble Shooting Charts is also given in para.4.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 102). The table provides information, including component Location, required for rectification. Component Location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

ALL procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, and that electrical power is available, unless otherwise stated. If the fault is net rectified, check the wiring in accordance with the Wiring Diagram manual (Ref. Table 102).

NOTE: If two symmetrical buckets systems or more are in incorrect position in modulation range, NASU must be suspected.

R NOTE: If reverse system is defective on one nacelle only and
R if stop-over time does not allow immediate
R reconditioning, it is possible to clear the aircraft
R for another flight by bringing the buckets to the 10°
R position and by locking the complete system in this
R position, as per Maintenance Manual 78-00-00

WARNING: BEFORE CARRYING OUT ANY VISUAL INSPECTION ON THE BUCKETS, ENSURE THAT NO SOURCE OF COMPRESSED AIR IS CONNECTED TO THE GROUND TEST CONNECTORS OF THE TWIN SECONDARY NOZZLE.

2. Preparation

WARNING BEFORE CARRYING OUT ANY FUNCTIONAL TEST, ENSURE THAT PERSONNEL OR EQUIPMENT ARE CLEAR OF THE AREA SURROUNDINGDING THE BUCKETS.

R CAUTION: IN THE CASE OF AN OVERHEATING INCIDENT, CHANGE THE BUCKET PNEUMATIC DRIVE ACTUATOR (BPDA) IN THE OVERHEATED NACELLE AND SYSTEMATICALLY REPLACE ITS ELECTROMAGNETIC CONTROL VALVE. ALSO, THE CAREFUL INSPECTION OF THE ELECTRICAL WIRING IN THE BPDA COMPARTMENT, ITS REPLACEMENT IF NECESSARY, AND THE SYSTEMATICAL REMOVAL OF THE ELECTROMAGNETIC CONTROL VALVE FROM THE BPDA IN THE ADJACENT NACELLE, ARE RECOMMENDED

A. Ensure that bucket control system circuit breakers Listed in Table 101 are set.

B. Before any intermediate connection or signal measurement on bucket system aircraft wiring, take special care to the ad- justment an connection of measurement instruments.

C. Ensure that extant power supply is connected.

D. Ensure that source of compressed air is connected to the ground test connector.

E. Switch on electrical ground power (Ref. 24-41-00).

SERVICE	PANEL	CIRCUIT BREAKER	NAP REF.
NASU 1 SUP	14-216	K1136	A 7
NASU 2 SUP	13-215	K1137	B13
A.D.C. 1 115V SUP	2-213	1F73	F 3
A.D.C. 1 28V SUP	1-213	1F74	P12
A.D.C. 2 115V SUP	13-216	2F73	F15
A.D.C. 2 28V SUP	5-213	2F74	F12
LH UC WEIGHT SW	1-213	G292	N17
LH UC WEIGHT SW	3-213	G293	B 8
RH UC WEIGHT SW	3-213	G294	B 9
RH UC WEIGHT SW	1-213	G295	N18
Engine NO. 1			
REHEAT CONT	15-216	1K1542	E 9
BUCKET CONT UNIT SUP	14-215	1K 1132	E 12
REV THRUST ASOV	3-213	1K 334	G 3
PP MGT LTS SUP	5-213	1E 461	D 1
WIND DOWN CONT SUP	1 5-213	1K 1101	B 1
WIND DOWN CONT SUP	2 1-213	1K 1108	C 7

SERVICE	PANEL	CIRCUIT BREAKER	NAP REF.
PP MGT LTS SUP (CROSSFEED)	1-213	2E 461	E 3
REV BUCKET POSN IND	5-213	1E 121	A 3
WIND DOWN IND	5-213	1K 1102	B 3
Engine N0. 2			
REHEAT CONT	15-215	2K1542	D15
BUCKET CONT UNIT SUP	13-215	2K 1132	G 14
REV THRUST ASOV CONT	1-213	2K 334	D 7
PP MGT LTS SUP (CROSSFEED)	1-213	2E 461	E 3
WIND DOWN CONT SUP	1 1-213	2K 1101	F 4
WIND DOWN CONT SUP	2 5-213	2K 1108	C 1
PP MGT LTS SUP	5-213	1E 461	D 1
REV THRUST CONT	1-213	2K 331	B 5
REV BUCKET POSN IND	1-213	2E 121	B 7
WIND DOWN IND	1-213	2K 1102	F 6
Engine NO. 3			
REHEAT CONT	15-215	3K1542	D16
BUCKET CONT UNIT SUP	13-216	3K 1132	C 6
REV THRUST ASOV CONT	1-213	3K 334	D 8
PP MGT LTS SUP (CROSSFEED)	1-213	3E 461	E 4
WIND DOWN CONT SUP	1 1-213	3K 1101	F 5
WIND DOWN CONT SUP	2 5-213	3K 1108	C 2
PP MGT LTS SUP	5-213	E 461	D 2
REV THRUST CONT	1-213	3K 331	B 6
REV BUCKET POSN IND	1-213	3E 121	B 8
WIND DOWN IND	1-213	3K 1102	F 7
Engine NO.4			
REHEAT CONT	15-216 4	K1542	E10
BUCKET CONT UNIT SUP	14-216	4K 1132	C 6
REV THRUST ASOV CONT	3-213	4K 334	G 4
PP MGT LTS SUP	5-213	4E 461	D 2
WIND DOWN CONT SUP	1 5-213	4K 1101	B 2
WIND DOWN CONT SUP	2 1-213	4K 1108	C 8
PP MGT LTS SUP (CROSSFEED)	1-213	3E 461	E 4
REV THRUST CONT	3-213	4K 331	D 2
REV BUCKET POSN IND	5-213	4E 121	A 4
WIND DOWN IND	5-213	4K 1102	B 4

NOTE: Whatever engine bay is undergoing a trouble-shooting, each of the circuit breakers "REHEAT CONT" must be switched ON to permit performance of crossfeed isolation circuit test.

Circuit Breakers
Table 101

3. TROUBLE SHOOTING

A. PREPARE TO TROUBLE SHOOT (REF. PARA. 2). POSITION THE THROTTLE LEVER FULLY REARWARD IN ITS GATE WITH THRUST REVERSE LEVER FULLY DOWN AND APPLY 3 BARS (43 PSIG). ON THE GROUND TEST CONNECTOR CHECK SECONDARY NOZZLE INDICATOR SHOWS 18 DEG. 30 TO 23 DEG. 30

OK

NOT OK –
1. SECONDARY NOZZLE INDICATOR DOES NOT SHOW 18 DEG. 30 TO 23 DEG. 30 YET, BUCKETS ARE IN CORRECT POSITION - CHART 101.
2. BUCKETS ARE IN WRONG POSITION, BETWEEN 0 AND 25 DEG. - CHART 102.
3. BUCKETS POSITION IS 27 DEG. APPROX. - CHART 103.

B. PULL THE THRUST REVERSE LEVER TO THE REVERSE BAULK AND OBSERVE BUCKETS AND INDICATORS. CHECK THAT BUCKET TRAVEL IS SMOOTH, THAT BUCKETS REACH ANGULAR POSITION Z = 73 DEG., THAT END OF RUN IS CORRECTLY SNUBBED AND THAT TRAVEL TIME DOES NOT EXCEED 2.5 SECONDS.
CHECK THAT BLUE REV CAPTION FLASHES WHILST BUCKETS ARE IN TRANSIT AND STAYS ON CONTINUOUSLY WHEN BUCKETS REACH 73 DEG.

NOTE : IF PRIMARY NOZZLE IS OPEN "CON" CAPTION WILL ILLUMINATE WHEN BUCKETS ARE IN REVERSE POSITION.

OK

NOT OK –
1. BUCKET SYSTEM ERRATIC IN TRAVEL - CHART 104.
2. BUCKETS DO NOT MOVE TO THRUST RESERVE. - CHART 105.
3. BUCKETS MOVE TO 73 DEG., BUT BPDA DOES NOT SNUB.
CHANGE BPDA (33).
4. TIME EXCESSIVE FOR TRAVEL - CHART 106.
5. BLUE LIGHT DOES NOT FLASH DURING TRANSIT. - CHART 114.
6. BLUE LIGHT DOES NOT GO STEADY AT END OF TRAVEL - CHART 115.

C. SELECTING POWER IN REVERSE, POSITION THE THRUST REVERSE LEVER TO FULLY REARWARD POSITION
IF -

OK

NOT OK – BUCKETS ARE AT 73 DEG., BUT BAULK HAS NOT BEEN REMOVED TO ENABLE THE LEVER TO MOVE FULLY REARWARD - CHART 108.

CONTINUED ON PAGE 105

CONTINUED FROM PAGE 104

D. CANCELLING REVERSE, POSITION THE THRUST REVERSE LEVER DOWN TO FORWARD BAULK POSITION AND OBSERVE BUCKETS AND INDICATORS. CHECK THAT BUCKET TRAVEL IS SMOOTH, THAT BUCKETS RETURN TO ANGULAR POSITION Z = 21 DEG, THAT TRAVEL TIME DOES NOT EXCEED 2.5 SECONDS AND THAT FORWARD BAULK IS REMOVED.
IF

OK

NOT OK —
1. BUCKETS REMAIN AT 73 DEG.
- CHART 109.
2. TIME EXCESSIVE FOR TRAVEL.
- CHART 106.
3. BUCKETS ARRIVE AT 21 DEG APPROX, BUT FORWARD THRUST NOT AVAILABLE.
- CHART 113.

E. CHECK CROSSFEED ISOLATION VALVE. DO NOT ENERGIZE THE ISOLATION CIRCUIT. OPEN THE ADJACENT BAY GROUND TEST CONNECTOR. CHECK FOR LEAKS.

NOTE : IF OK REBLANK THE GROUND TEST CONNECTOR.

OK

NOT OK — CHANGE THE CROSSFEED ISOLATION VALVE (37)

F. PLACE THE ADC TEST SELECTOR IN POSITION "2" AND CHECK THAT BUCKETS ARE AT 0 DEG. BY CHECKING THAT THE BUCKET JACK STROKE X IS 0 MM.
IF -

OK

NOT OK — BUCKETS ARE OUT OF THIS ANGULAR POSITION - CHART 102.

G. PLACE THE ADC TEST SELECTOR IN POSITION "1" AND CHECK THAT THE BUCKETS MOVE TO BETWEEN 16 DEG 30 AND 20 DEG 30 BY CHECKING THAT THE BUCKET JACK STROKE X IS BETWEEN 65 AND 84 MM (2.56 AND 3.31 IN).
IF

OK

NOT OK — BUCKETS ARE OUT OF THIS ANGULAR POSITION - CHART 102

CONTINUED ON PAGE 106

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CONTINUED FROM PAGE 105

H. PLACE THE ADC TEST SELECTOR IN POSITION "NORM" AND CHECK THAT BUCKETS MOVE TO BETWEEN 19 DEG AND 23 DEG BY CHECKING THAT THE BUCKET JACK STROKE X IS BETWEEN 76 AND 96 MM (2.99 AND 3.78 IN).
IF -

NOT OK — BUCKETS ARE OUT OF THIS ANGULAR POSITION - CHART 102

OK

I. POSITION THE NOZ AIR SOV AND WIND DOWN TEST SWITCH TO POSITION E. SELECT REVERSE BY PULLING THE THRUST REVERSE LEVER TO THE REVERSE BAULK POSITION. THE BUCKETS WILL ROTATE. THE ASOV WILL CLOSE AT 27 DEG. AND BUCKETS WILL STOP AT 35 DEG. APPROX.

NOT OK — BUCKETS MOVE TO 73 DEG. CHART 111.

OK

SELECT ASOV OFF, RESELECT FORWARD IDLE, BUCKETS RETURN TO 21 DEG.

J. IN FLIGHT REVERSE CHECK. CONNECT THE COMPRESSED AIR SOURCE TO EITHER ENGINE 1 OR 4. POSITION THE 4 THROTTLE LEVERS FULLY REARWARD IN THEIR GATES WITH THRUST REVERSE LEVERS FULLY DOWN. DEPRESS "FLIGHT REVERSE ARM" SWITCH, CHECK THAT SWITCH LATCHES "ON" AND THAT "OPEN" CAPTION ILLUMINATES. PULL THE THRUST REVERSE LEVERS ON ENGINE 2 OR 3 TO THE REVERSE BAULK AND CHECK THAT BUCKETS REACH ANGULAR POSITION Z = 73 DEG. CHECK THAT THE TRAVEL TIME IS BETWEEN 2 AND 3.5 SEC. IF AN "ULTRA TEST SET" IS AVAILABLE, CHECK THAT "BOOSTED IDLE" OPERATES CORRECTLY ON ENGINES 1 AND 4 ENGINE CONTROL UNITS DURING BUCKET TRAVEL.

NOT OK —

1. BUCKETS DO NOT MOVE TO 73 DEG. CHART 105
2. TIME EXCESSIVE FOR TRAVEL-CHART 110.
3. "BOOSTED IDLE "DOES NOT OPERATE REFER TO ENGINE CONTROL UNIT TROUBLE SHOOTING

CMS 71 00 51 1 AAMC

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SECONDARY NOZZLE INDICATOR DOES NOT SHOW 18 DEG 30 TO 23 DEG 30 AND BUCKETS ARE IN CORRECT POSITION (21 DEGREES APPROX.)

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 28 VDC 115V, 400 HZ	
NTRC SIGNAL MEASUREMENT BOX	293094-1
MULTIMETER	
CIRCUIT-BREAKER SAFETY CLIPS	

NOTE : UTILIZATION OF NTRC SIGNAL MEASUREMENT BOX IS GIVEN IN CHAPTER 78-36-01.

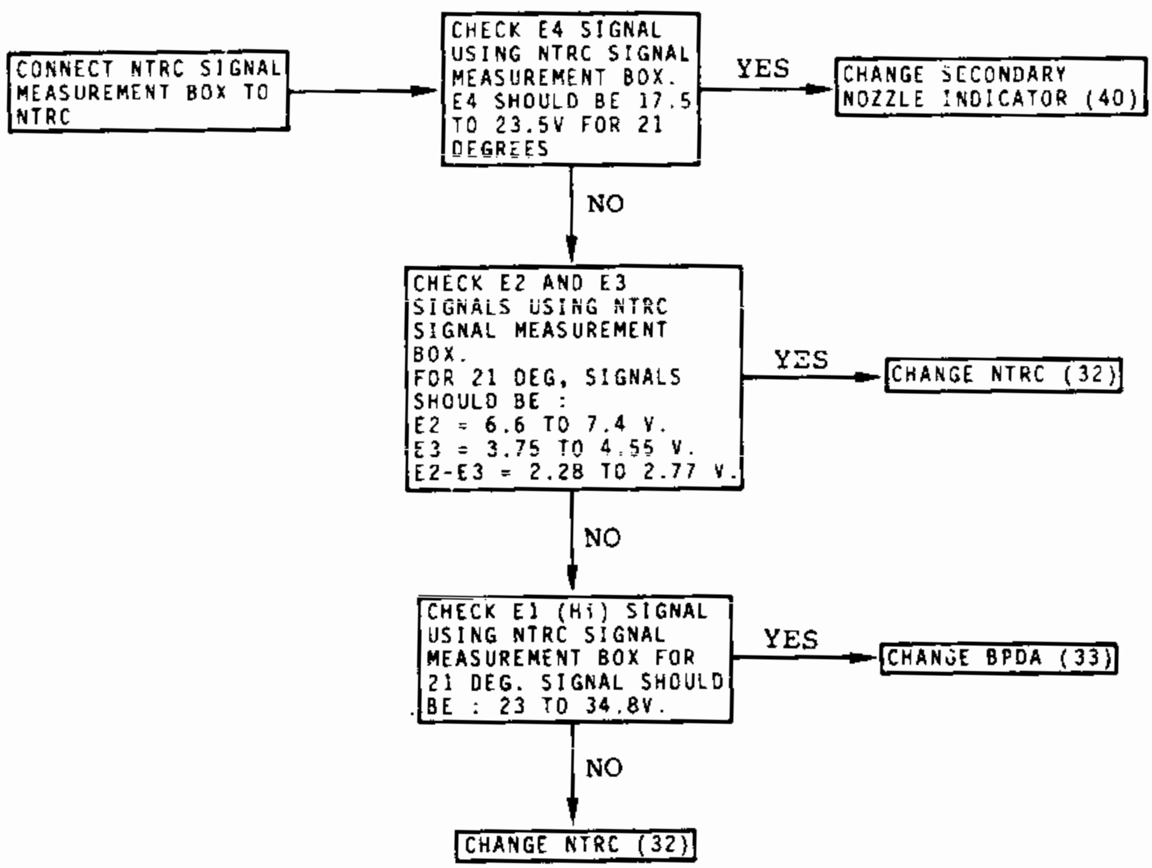

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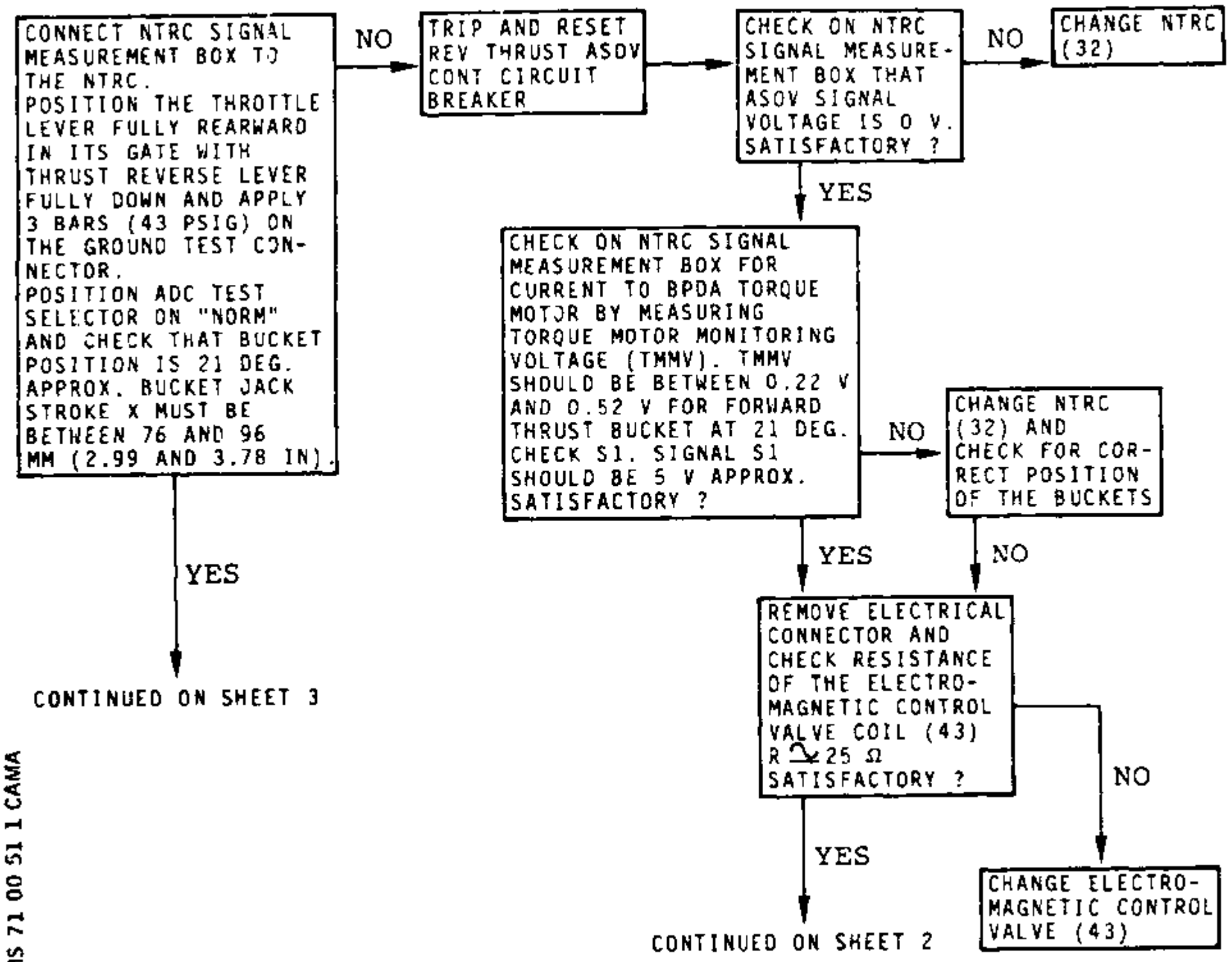
Chart 101

MODULATION FAILURE

GROUND EQUIPMENT REQUIRED	PART NO.
DESCRIPTION	
POWER SUPPLY 28 VDC 115 V, 400 HZ	
COMPRESSED AIR SUPPLY	
NTRC SIGNAL MEASUREMENT BOX	293094-1
EXTENSION	9970-515-296
MULTIMETER	
CIRCUIT-BREAKER SAFETY CLIPS	

NOTE 1 : IF THE NASU (31) IS CAUSE OF MODULATION MALFUNCTION, BOTH BUCKET SYSTEMS CONTROLLED BY THE NASU WILL HAVE THE SAME MALFUNCTION.

NOTE 2 : UTILIZATION OF THE NTRC SIGNAL MEASUREMENT BOX IS GIVEN IN CHAPTER 78-36-01.



CMS 71 00 51 1 CAMA

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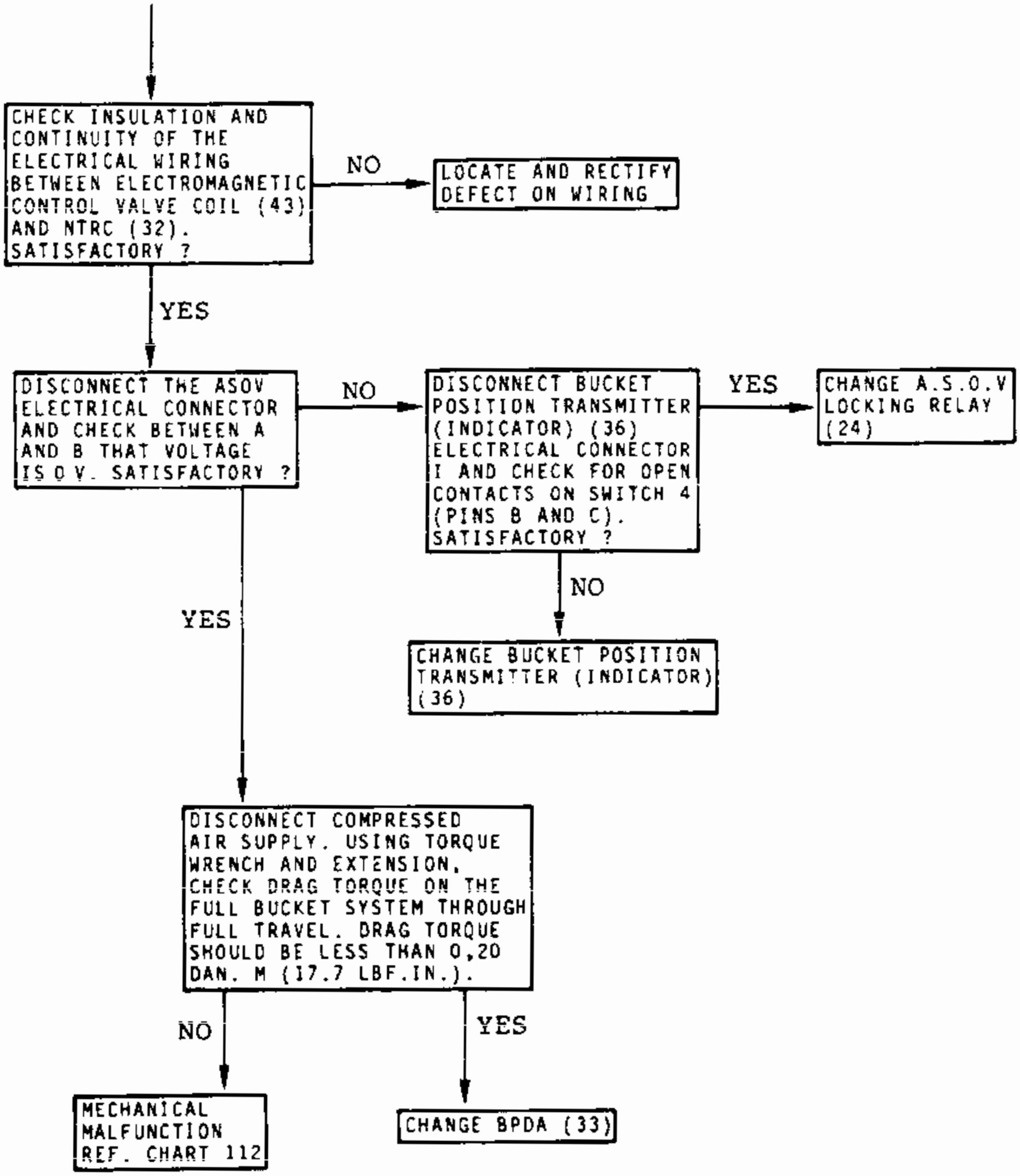
Chart 102 (Sheet 1 of 3)

CONTINUED FROM SHEET 1



CMS 71 00 51 II CAMB

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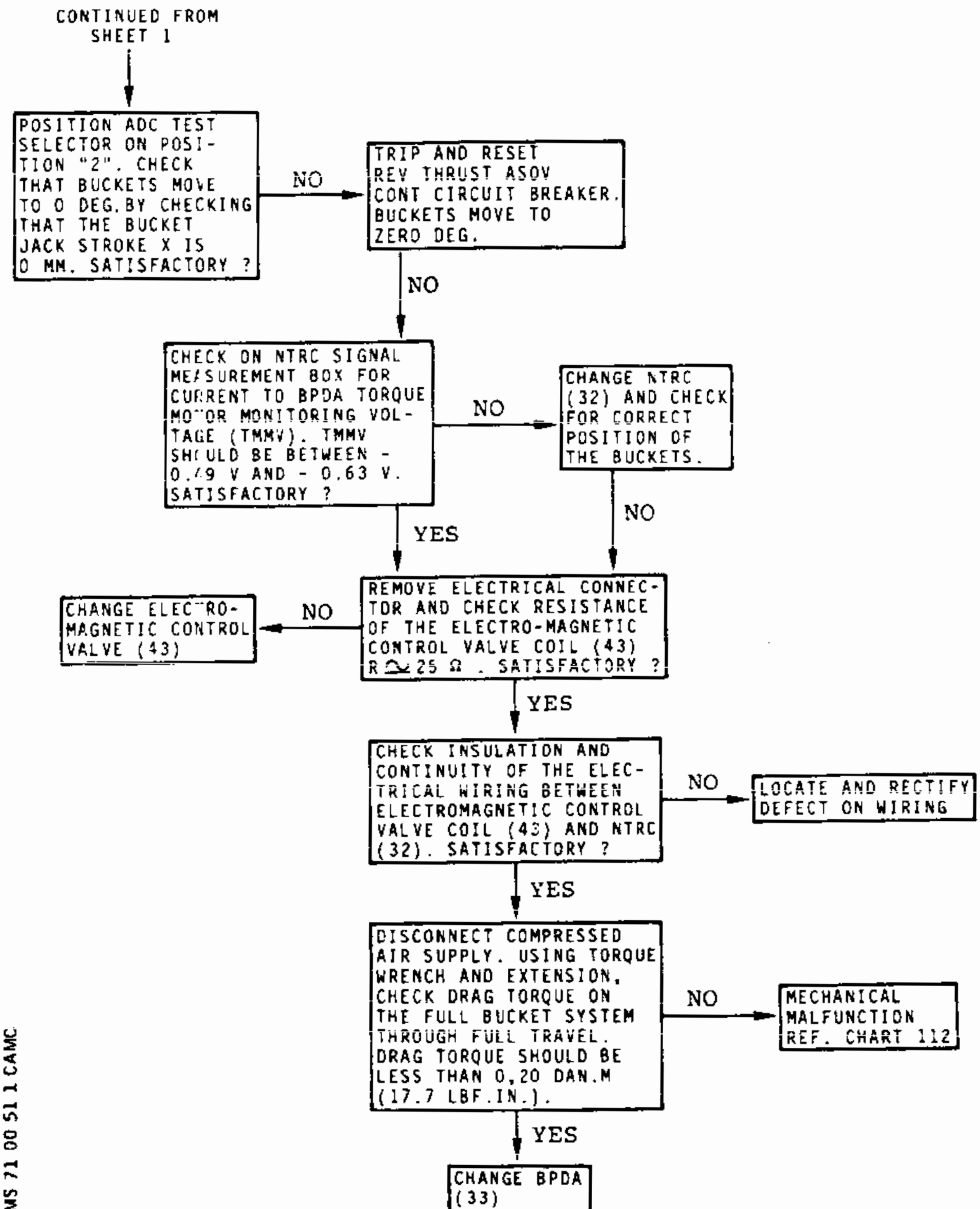
Chart 102 (Sheet 2 of 3)



CMS 71 00 51 1 CAMC

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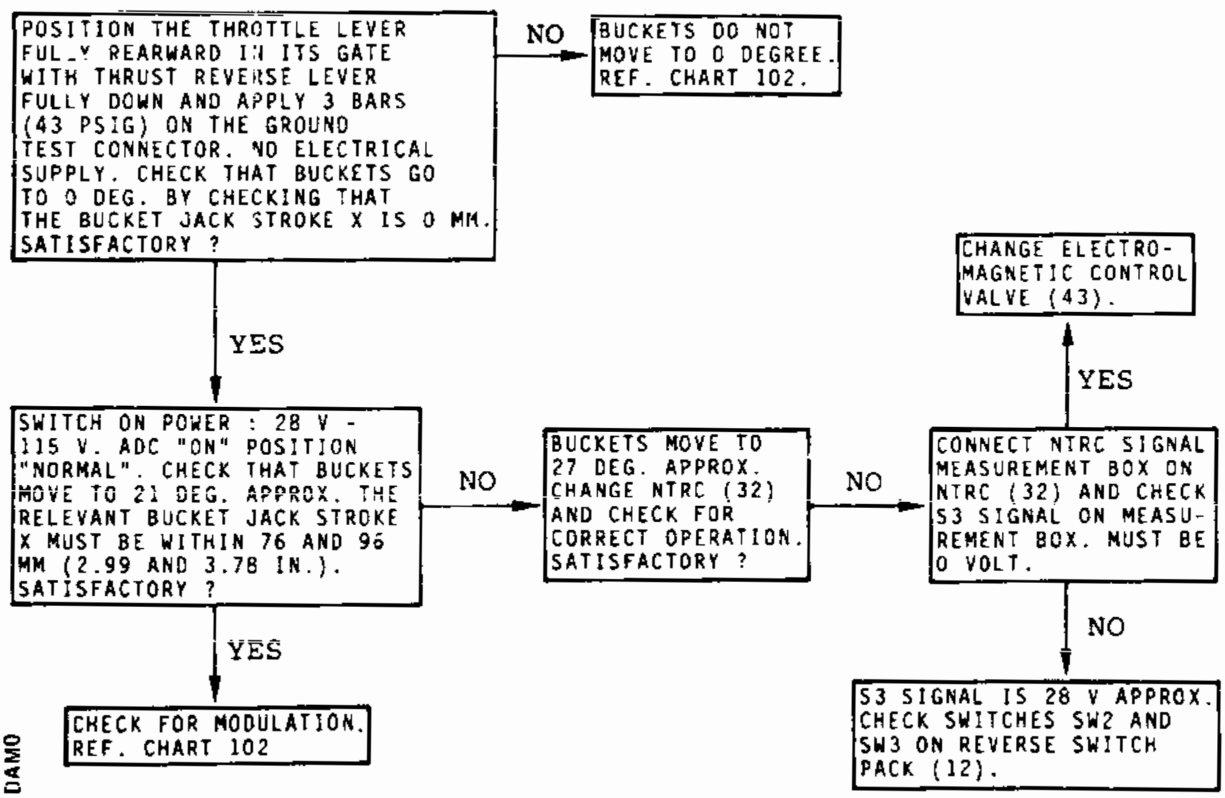
Chart 102 (Sheet 3 of 3)

BUCKETS POSITION IS 27 DEGREES APPROX.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 28 VDC 115 V, 400 HZ	
COMPRESSED AIR SUPPLY	
NTRC SIGNAL MEASUREMENT BOX	293094-1
MULTIMETER	
CIRCUIT-BREAKER SAFETY CLIPS	

<u>NOTE</u> : UTILIZATION OF NTRC SIGNAL MEASUREMENT BOX IS GIVEN IN CHAPTER 78-36-01.



CMS 71 00 51 1 DAMO

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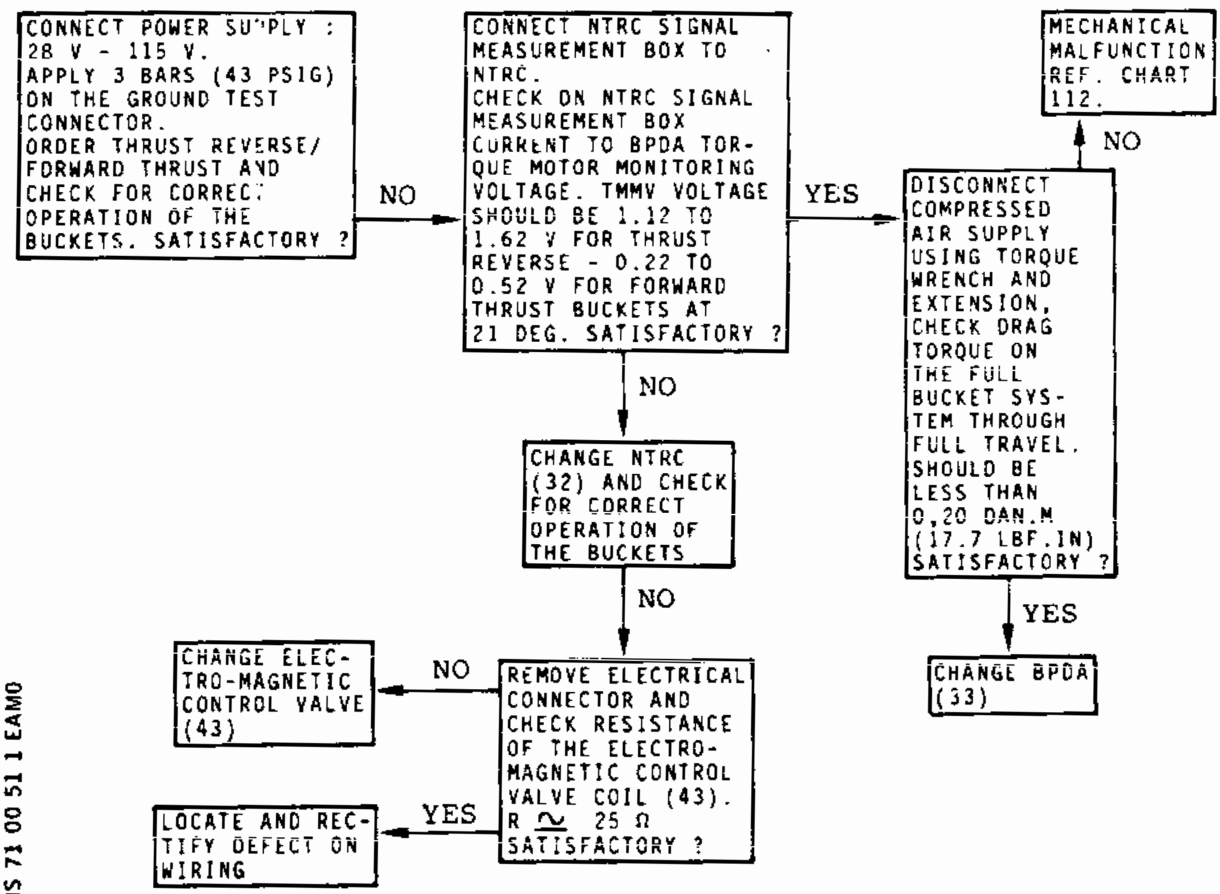
Chart 103

SYSTEM ERRATIC IN TRAVEL

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 28 VDC 115 V, 400 HZ	
COMPRESSED AIR SUPPLY	
NTRC SIGNAL MEASUREMENT BOX	293094-1
MULTIMETER	
TORQUE WRENCH (0 TO 30 LBF IN IN RANGE)	
EXTENSION	9970-515-296
CIRCUIT-BREAKER CLIPS	

NOTE . UTILIZATION OF NTRC SIGNAL MEASUREMENT BOX IS GIVEN IN CHAPTER 78-36-01



CMS 71 00 51 1 EAMO

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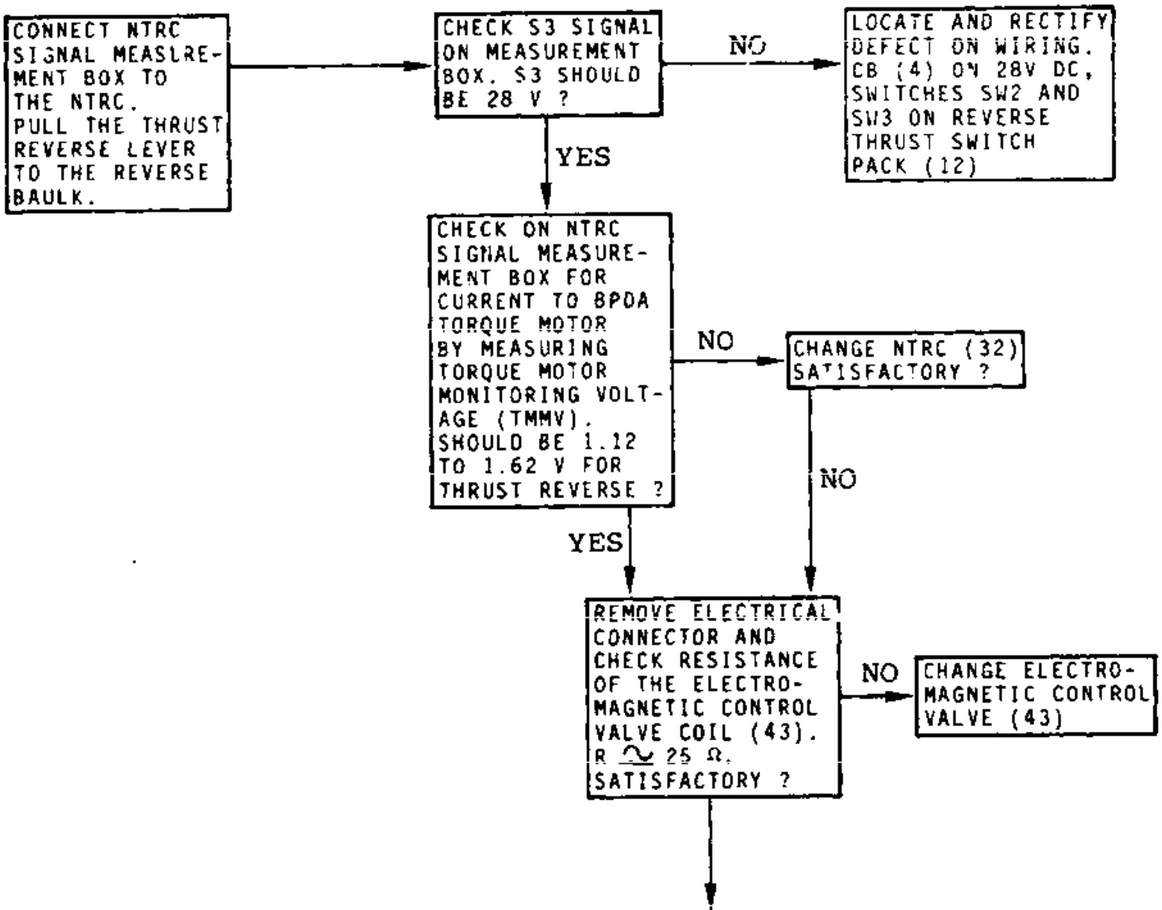
Chart 104

BUCKETS DO NOT MOVE TOWARD THRUST REVERSE POSITION

GROUND EQUIPMENT REQUIRED	PART NO.
DESCRIPTION	
POWER SUPPLY 28 VDC 115 V, 400 HZ	
COMPRESSED AIR SUPPLY	
NTRC SIGNAL MEASUREMENT BOX	293094-1
MULTIMETER	
TORQUE WRENCH (0 TO 30 LBF.IN IN RANGE)	
EXTENSION	9970-515-296
CIRCUIT-BREAKER SAFETY CLIPS	

NOTE : UTILIZATION OF NTRC SIGNAL MEASUREMENT BOX IS GIVEN IN CHAPTER 78-36-01



CONTINUED ON SHEET 2

CMS 71 00 51 1 FAMA

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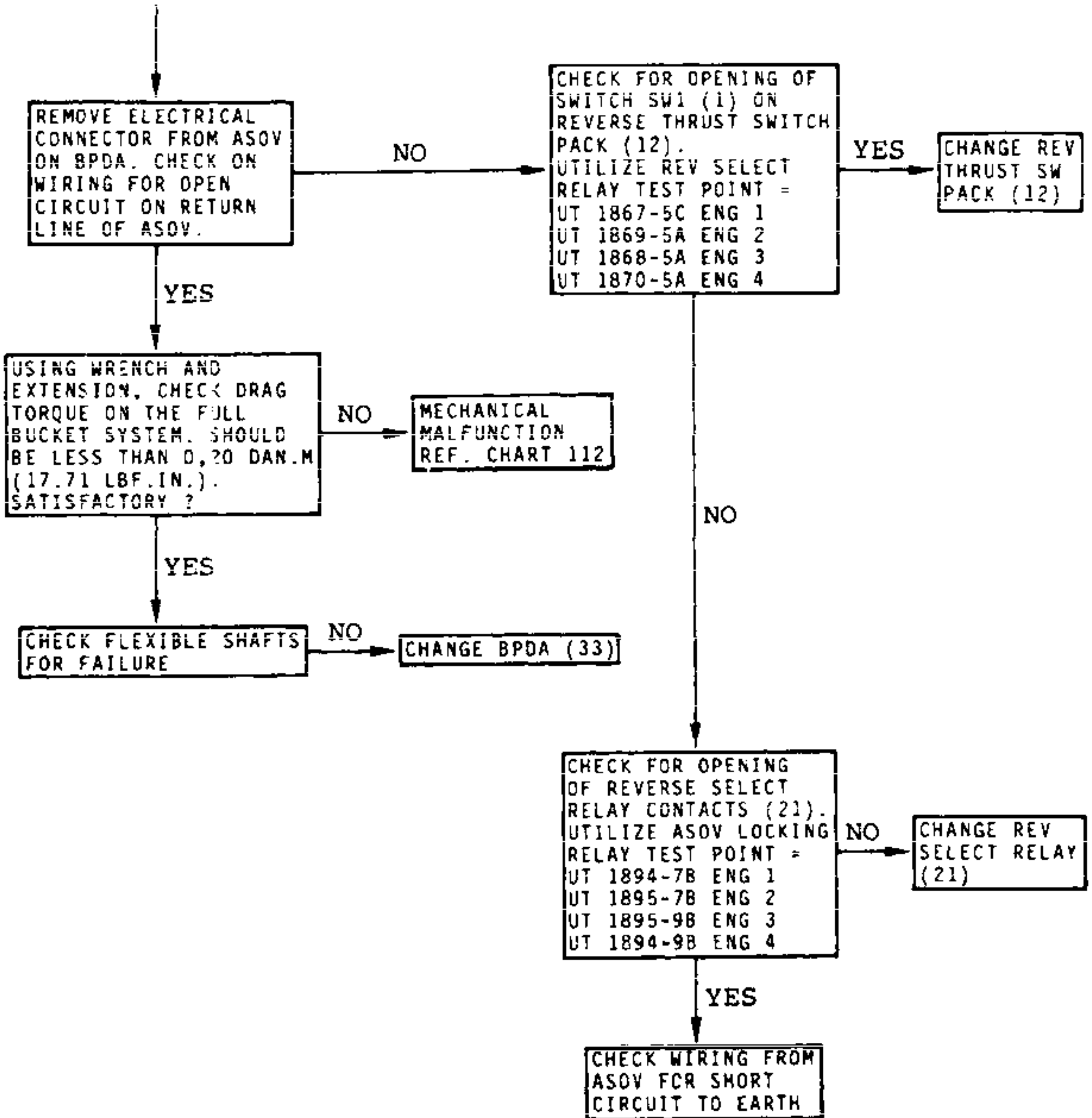
Chart 105 (Sheet 1 of 2)

CONTINUED FROM SHEET 1



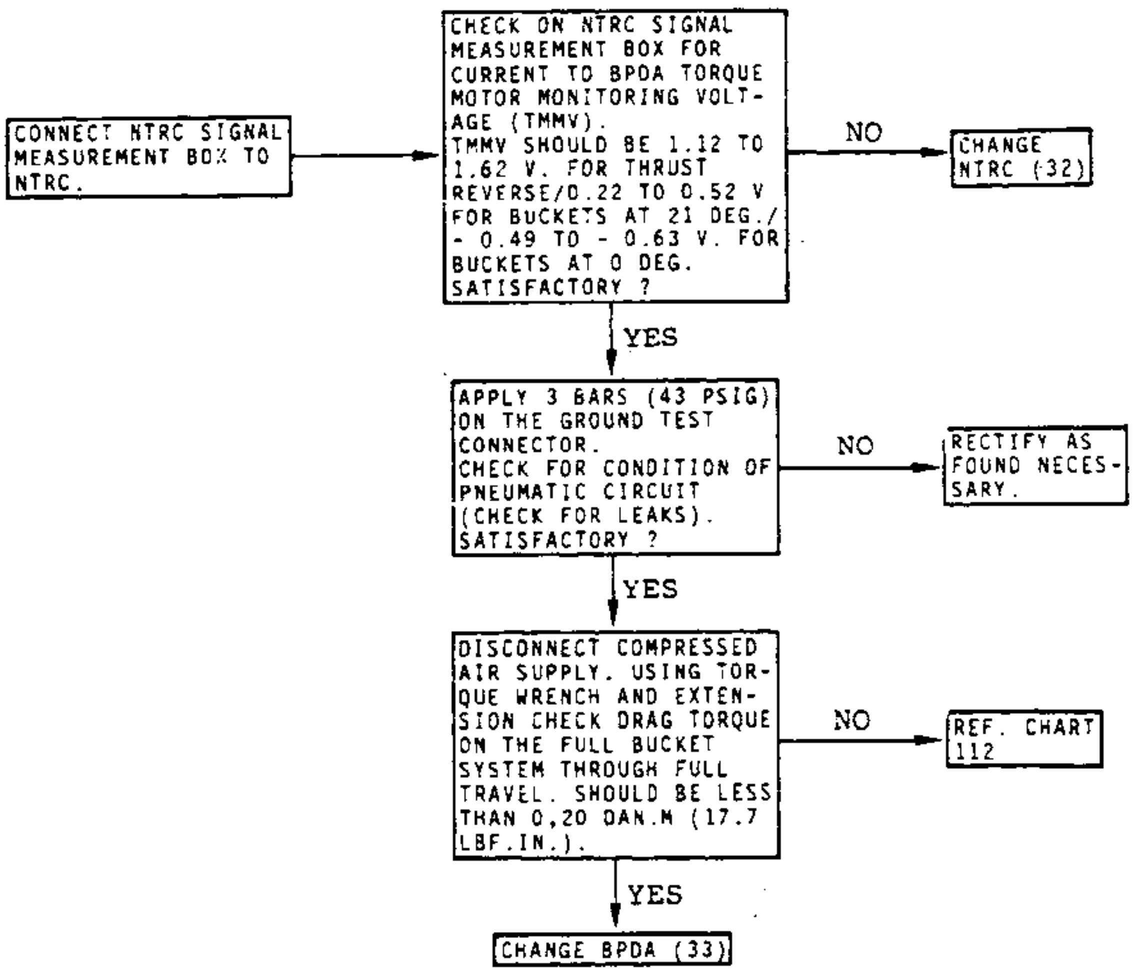
CMS 71 00 51 1 FAMB

R Chart 105 (Sheet 2 of 2)

TIME EXCESSIVE
FOR TRAVEL

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
COMPRESSED AIR SUPPLY	
POWER SUPPLY : 28 VDC	
115 V, 400 HZ	
NTRC SIGNAL MEASUREMENT BOX	293094-1
MULTIMETER	
TORQUE WRENCH (0 TO 30 LBF.IN IN RANGE)	
EXTENSION	9970-515-296
CIRCUIT-BREAKER SAFETY CLIPS	

NOTE : UTILIZATION OF NTRC SIGNAL MEASUREMENT BOX IS GIVEN IN CHAPTER 78-36-01.



CMS 71 00 51 1 GAMO

Chart 106

GROUND EQUIPMENT REQUIRED		PART NO
DESCRIPTION	NOZZLE TRIM ANGLE TEST SET PE 35380	
POWER SUPPLY	28 VDC 115 V, 400Hz	
MULTIMETER CIRCUIT BREAKER SAFETY CLIPS		

'CON' CAPTION ILLUMINATES IN REVERSE, AJ ABOVE 15%

CHECK AIRCRAFT HISTORY FOR ANY PREVIOUS SIMILAR DEFECTS

CHECK ECA FUNCTION OK

1. CONNECT NOZZLE TRIM ANGLE TEST SET PE35380 TO SKT 2 OF ECA
2. SELECT ECA 'ON LINE'
3. CHECK TEST SET INDICATES MAX READING
4. SELECT ASOV TEST SWITCH TO POSN 'A'
5. SELECT REVERSE BY PULLING REVERSE LEVER TO REVERSE BAULK
6. CHECK TEST SET PROGRESSIVELY INDICATES MINIMUM READING
7. DESELECT REVERSE
8. CHECK TEST SET RETURNS TO MAX READING
9. SELECT ASOV TEST SWITCH TO 'OFF'
10. SELECT ECA TO 'OFF'
11. REMOVE TEST SET

WAS TEST SATISFACTORY ?

NO

INTERCHANGE ENGINE CONTROL AMPLIFIER WITH FIM AMPLIFIER, REPEAT TEST

IS TEST SATISFACTORY ?

YES

CHANGE ORIGINAL ENGINE CONTROL AMPLIFIER

NO

CHECK WIRING FOR AJ MIN SIGNAL DPX AA PINS 10 AND 1

YES

INSPECT FOR SIGNS OF DAMAGE OR LEAKS

1. PNC P3 AIR SUPPLY TUBE AND CONNECTIONS
2. AIR TUBE PNC VALVE TO PRIMARY NOZZLE MANIFOLD
3. AIR TUBE PNC VALVE TO PN TRIM UNIT
4. PNC P7 AIR SUPPLY TUBE AND CONNECTIONS
5. CHECK PNC P7 PROBE

WAS INSPECTION SATISFACTORY ?

NO

RECTIFY DEFECT

YES

FOLLOW SHEET 2

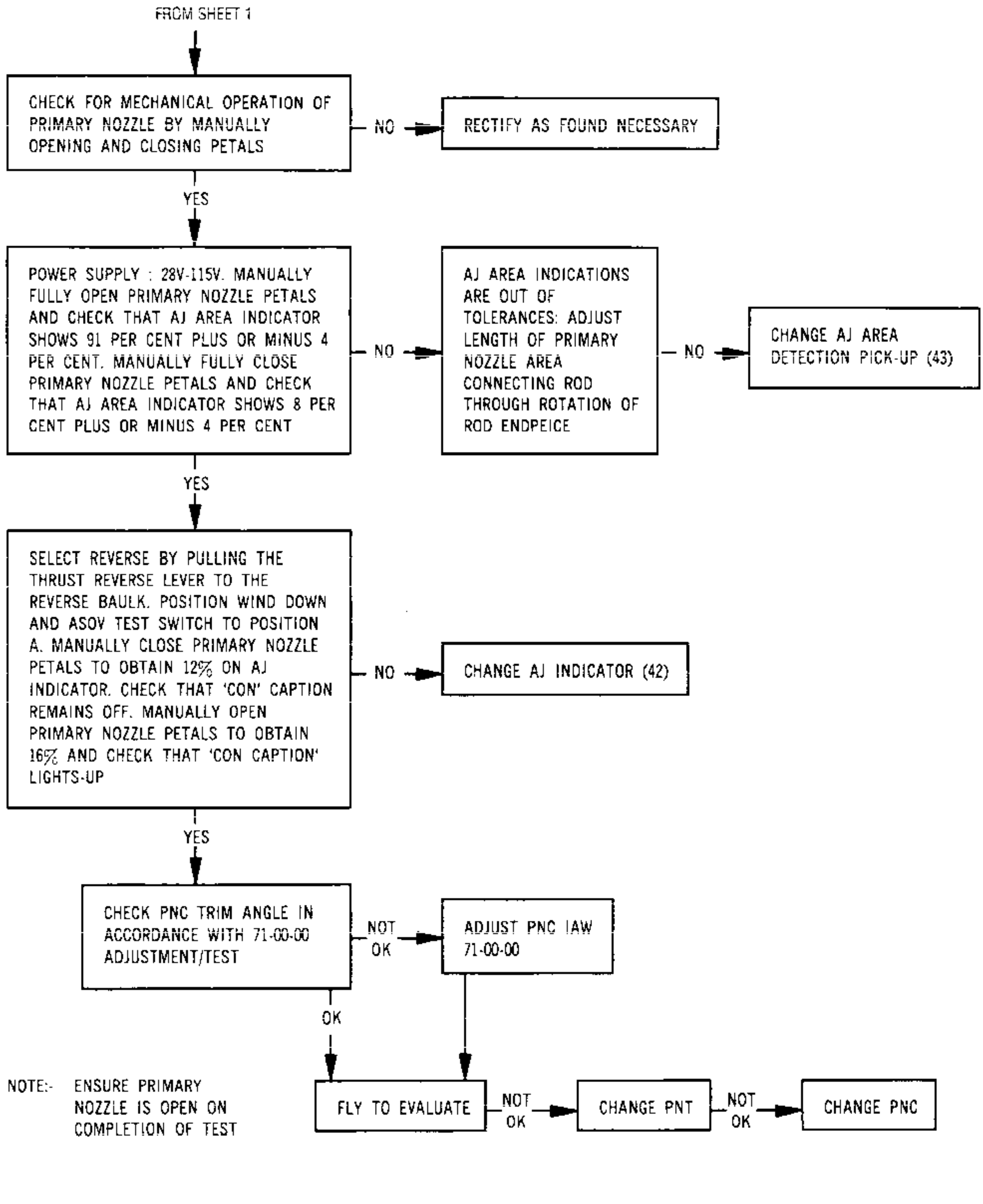
CR 36361/008

R
R
R

Chart 107 (Sheet 1 of 2)

R

CR 36115/000



R R R R R R R R R R R R R

Chart 107 (Sheet 2 of 2)

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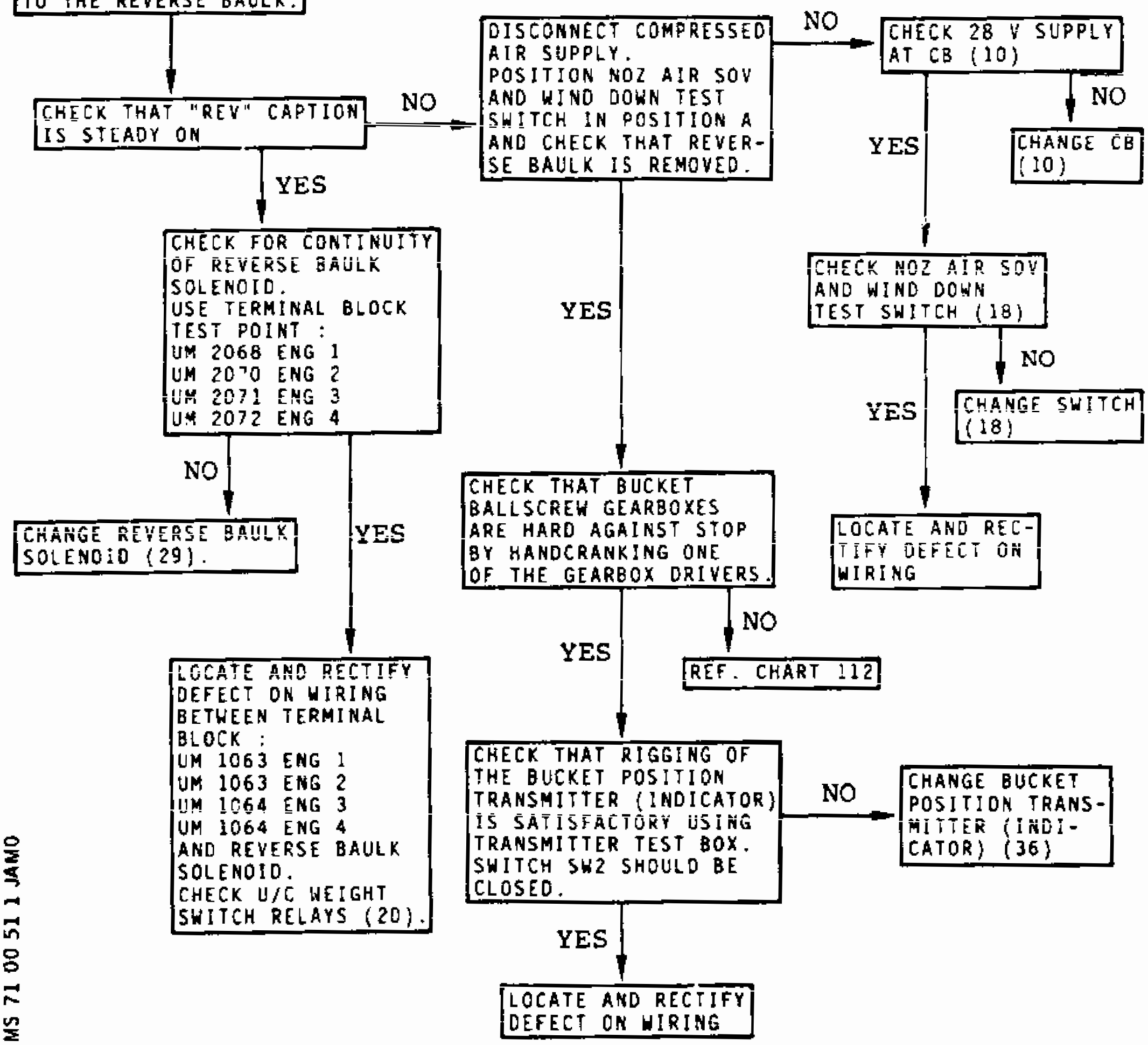
GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 28 VDC, 115 V, 400 HZ	
COMPRESSED AIR SUPPLY	
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-
BUCKET POSITION TRANSMITTER TEST BOX	9970-531-046



CMS 71 00 51 1 JAMO

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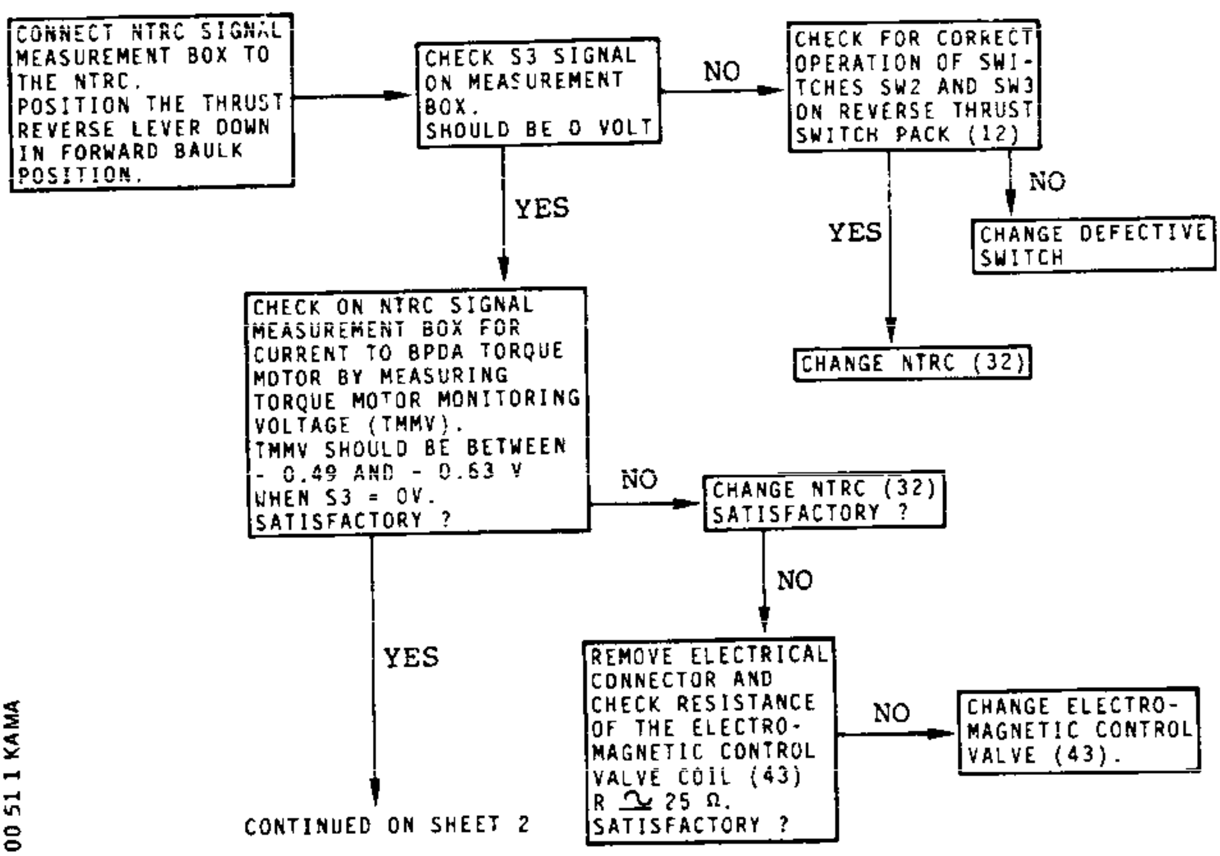
Chart 108

BUCKETS DO NOT RETURN TO FORWARD THRUST POSITION.

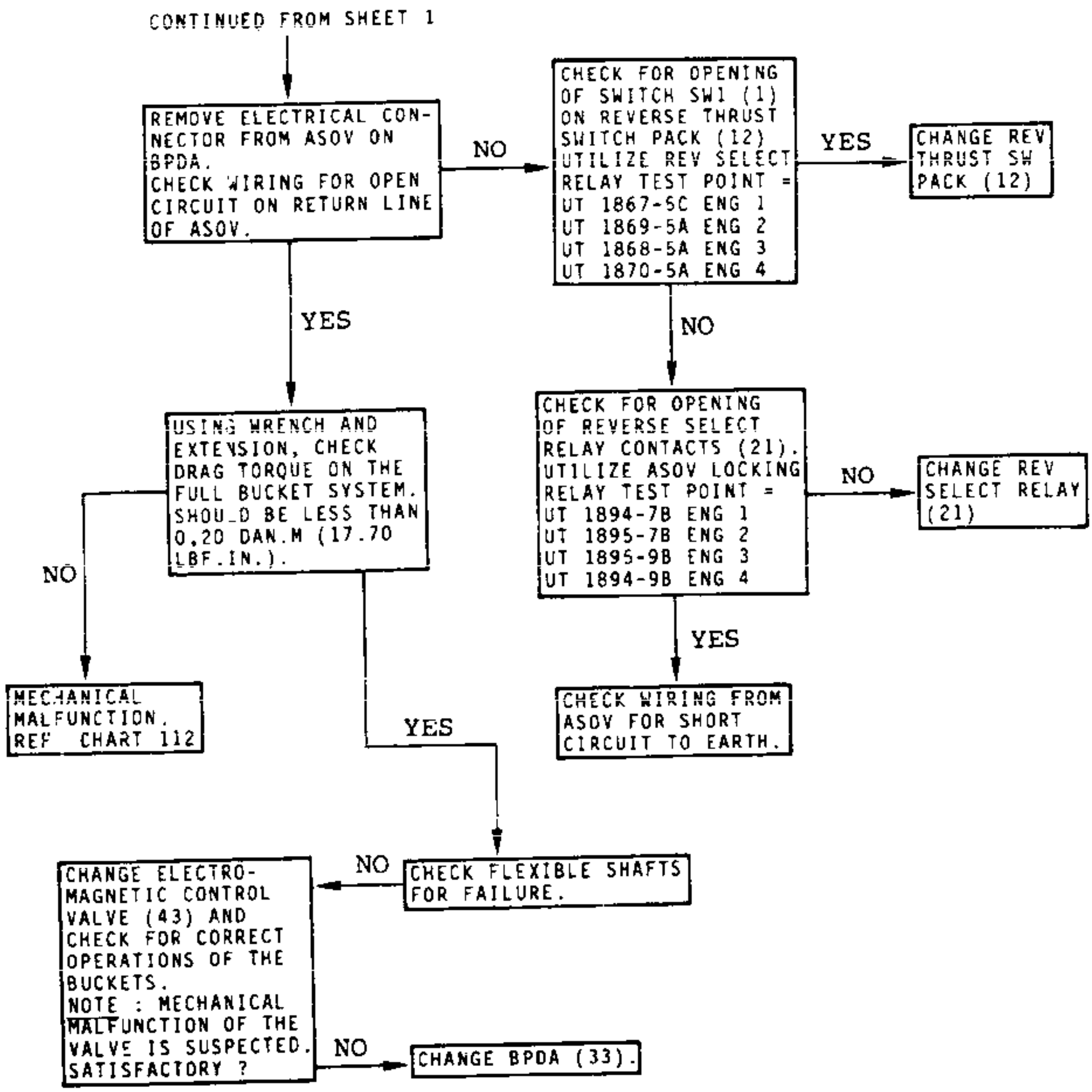
GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 28 VDC 115 V, 400 HZ	
COMPRESSED AIR SUPPLY	
NTRC SIGNAL MEASUREMENT BOX	293094-1
MULTIMETER	
TORQUE WRENCH (0 TO 30 LBF.IN IN RANGE)	
EXTENSION	9970-515-296
CIRCUIT-BREAKER SAFETY CLIPS	

NOTE : UTILIZATION OF NTRC SIGNAL MEASUREMENT BOX IS GIVEN IN CHAPTER 78-36-01.



CMS 71 00 51 1 KAMA

R Chart 109 (Sheet 1 of 2)



CMS 71 00 51 1 KAMB

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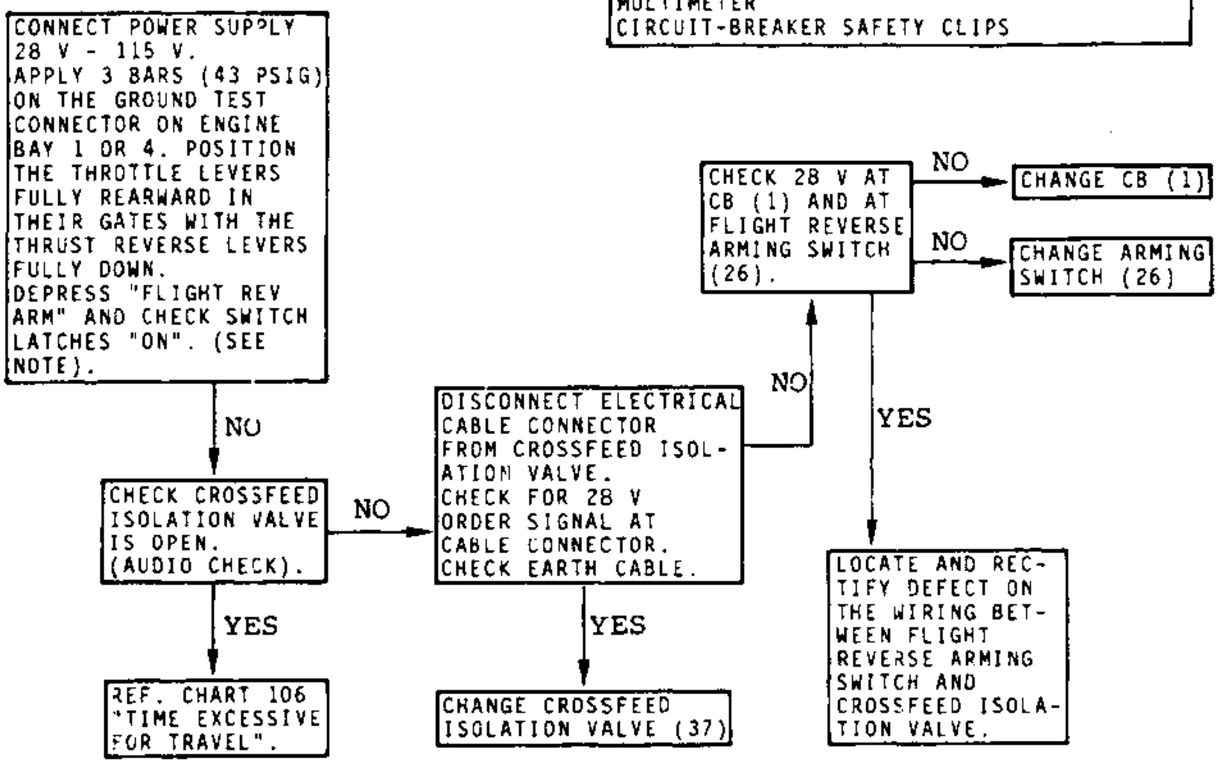
Chart 109 (Sheet 2 of 2)

IN-FLIGHT REVERSE,
TRAVEL TIME OF BUCKETS
EXCEEDS 3.5 SECONDS

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 28 VDC 115 V, 400 HZ MULTIMETER CIRCUIT-BREAKER SAFETY CLIPS	



NOTE 1 : IF THE IN-FLIGHT REVERSE ARMING SWITCH DOES NOT REMAIN LATCHED ON, CHECK THAT THE 4 THROTTLE LEVERS ARE FULLY REARWARD IN THEIR GATES AND THAT THE 4 THROTTLE 10 PER CENT RELAYS (25) ARE NOT ENERGIZED. CHECK FOR CONTINUITY BETWEEN IN FLIGHT REVERSE ARMING SWITCH (26) AND EARTH THROUGH THE 4 THROTTLE 10 PER CENT RELAYS (25). IF NOT OK : CHECK THROTTLE 10 PER CENT SWITCHES (25) AND WIRING.

NOTE 2 : EXCESSIVE TRAVEL TIME FOR IN-FLIGHT REVERSE COULD ALSO BE DUE TO ENGINE 1 OR 4 (AS APPLICABLE) E.C.U. NOT RECEIVING SIGNAL TO BOOST POWER.

CMS 71 00 51 1 LAMO

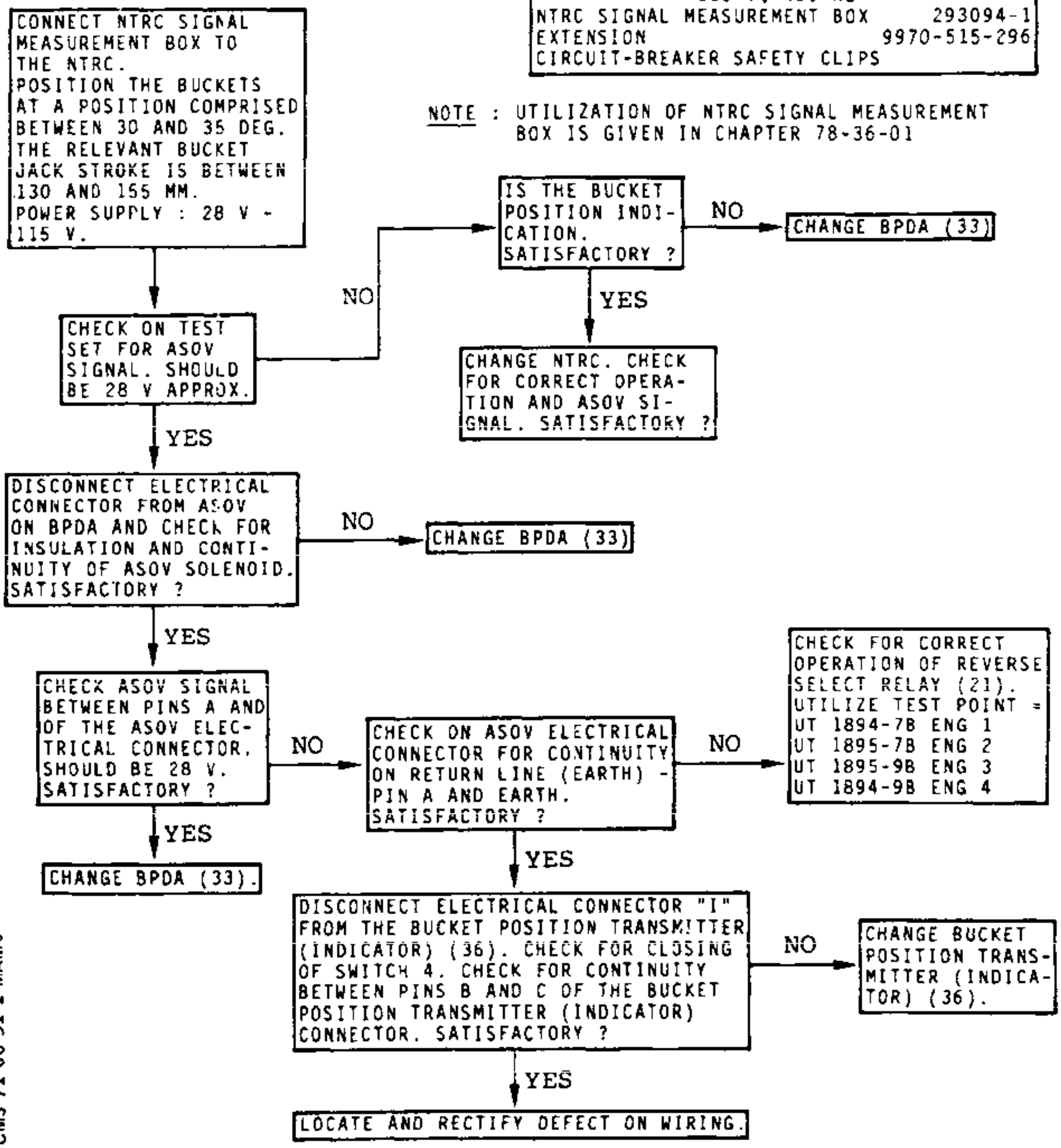
R

Chart 110

AIR SHUT-OFF VALVE
SAFETY CIRCUIT
MALFUNCTION

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 28 VDC 115 V, 400 HZ	
NTRC SIGNAL MEASUREMENT BOX	293094-1
EXTENSION	9970-515-296
CIRCUIT-BREAKER SAFETY CLIPS	

NOTE : UTILIZATION OF NTRC SIGNAL MEASUREMENT BOX IS GIVEN IN CHAPTER 78-36-01



CMS 71 00 51 1 MAMO

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Chart 111

MECHANICAL MALFUNCTION

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
TORQUE WRENCH (0 TO 30 LBF.IN IN RANGE) EXTENSION	9970-515-296

NOTE : WHEN TROUBLE SHOOTING FOR MECHANICAL FAILURE REFERENCE SHOULD ALSO BE MADE TO MM 78-30-00 THRUST REVERSER - INSPECTION/CHECK.

CHECK THAT INSTALLATION OF FLEXIBLE SHAFT ASSEMBLY IS SATISFACTORY.
- NO → CORRECT INSTALLATION OF FLEXIBLE SHAFTS.
- YES ↓

INSPECT VISUALLY FOR BINDING BETWEEN TWIN SECONDARY NOZZLE AND BUCKETS. SATISFACTORY ?
- NO → RECTIFY AS FOUND NECESSARY.
- YES ↓

DISCONNECT BALLSCREW GEARBOXES FROM BUCKETS.
CHECK FOR FREEDOM OF TRAVEL OF BUCKETS. SATISFACTORY ?
- NO → RECTIFY AS FOUND NECESSARY.
- YES ↓

CHECK EACH BALLSCREW GEARBOX FOR FREEDOM OF TRAVEL OF ROTATION. SATISFACTORY ?
- NO → CHANGE DEFECTIVE BALLSCREW GEARBOX (34).
- YES ↓

CHANGE BPDA (33).

CMS 71 00 51 1 NAMO

R

Chart 112

BUCKETS REACH 21 DEG APPROX. BUT FORWARD THRUST NOT AVAILABLE (FORWARD BAULK ENGAGED).

GROUND EQUIPMENT REQUIRED	PART NO.
DESCRIPTION	
POWER SUPPLY 28 VDC	
MULTIMETER	
CIRCUIT BREAKER SAFETY CLIPS	
BUCKET POSITION TRANSMITTER TEST BOX	9970-531-046

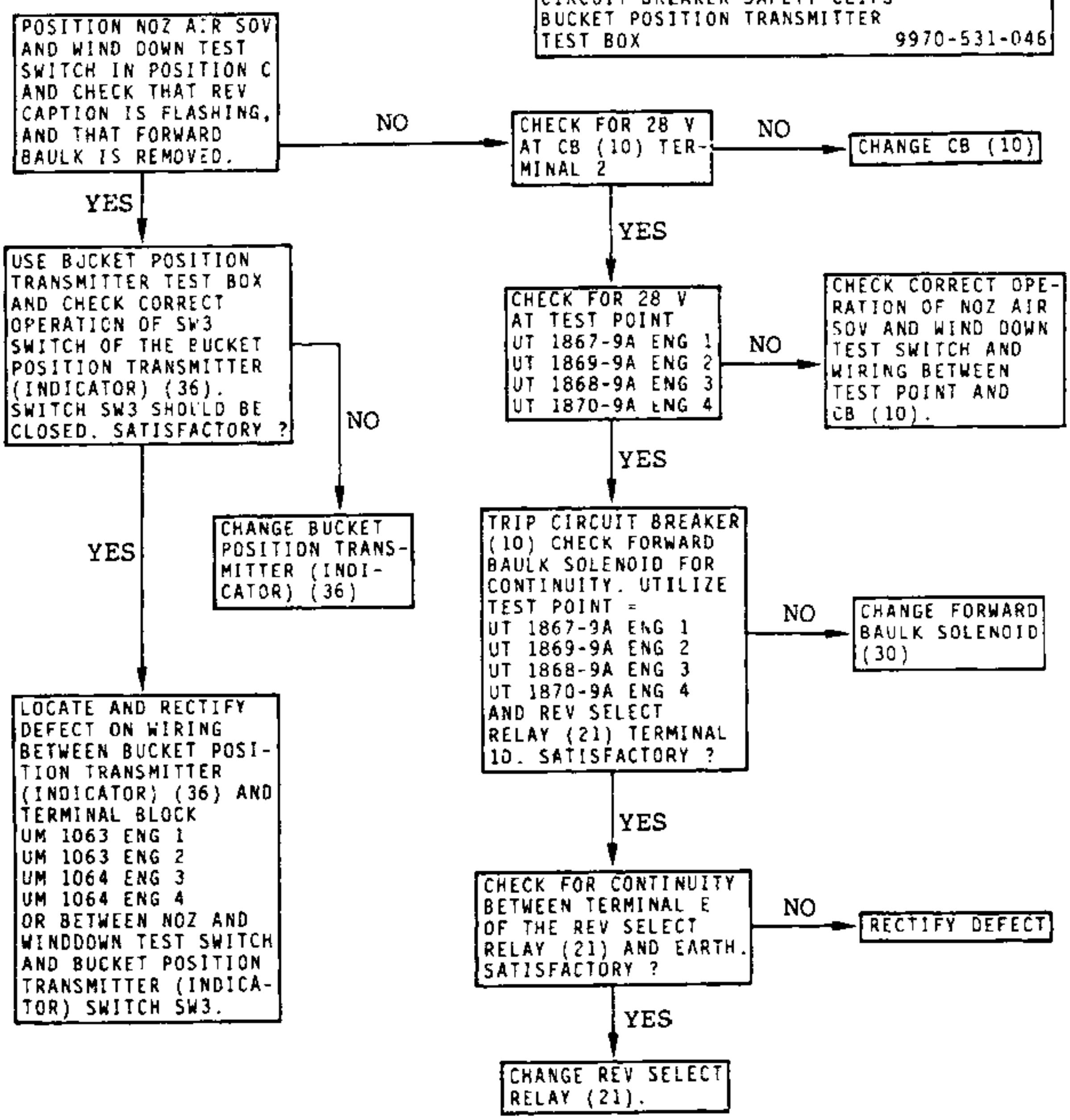

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Chart 113

BLUE LIGHT DOES NOT FLASH DURING TRANSIT

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 28 VDC 115V/400 HZ	
MULTIMETER	
BUCKET POSITION TRANSMITTER	
TEST BOX	9970-531-046
EXTENSION	9970-515-296

POWER SUPPLY : 28V - 115V. POSITION WIND DOWN AND ASOV TEST SWITCH TO POSITION C. CHECK THAT BLUE REV CAPTION IS FLASHING.

NO → CHANGE FLASHER UNIT (39)

YES ↓

POSITION WIND DOWN AND ASOV TEST SWITCH TO THE OFF POSITION. POSITION THE BUCKETS AT A POSITION COMPRISED BETWEEN 30 AND 35 DEG. THE RELEVANT BUCKET JACK STROKE MUST BE COMPRISED BETWEEN 130 AND 115 MM.

↓

CHECK THAT SWITCH SW3 OF THE BUCKET POSITION TRANSMITTER (INDICATOR) (36) IS OPEN.
UTILIZE TEST POINT :
UT 1867-9A ENG 1
UT 1869-9A ENG 2
UT 1868-9A ENG 3
UT 1870-9A ENG 4
VOLTAGE SHOULD BE 0 VOLT.

NO → CHECK INTEGRITY OF FLEXIBLE SHAFT BETWEEN BUCKET BALLSCREW GEARBOX AND BUCKET POSITION TRANSMITTER (INDICATOR) (36) SATISFACTORY ?

NO → CHANGE FLEXIBLE SHAFT

YES ↓

CHANGE BUCKET POSITION TRANSMITTER (INDICATOR) (36).

CMS 71 00 51 1 RAMO

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Chart 114

BLUE LIGHT DOES NOT GO STEADY AT END OF TRAVEL WHEN BUCKETS REACH 73 DEG.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 28 VDC 115 V/400 HZ	
MULTIMETER	
BUCKET POSITION TRANSMITTER	
TEST BOX	9970-531-046
EXTENSION	9970-515-296

POWER SUPPLY = 28 V - 115 V. POSITION WIND DOWN AND ASOV TEST SWITCH TO POSITION A. CHECK THAT BLUE REV CAPTION STEADY ILLUMINATES.

NO → CHANGE FLASHER UNIT (39)

YES ↓

POSITION WIND DOWN AND ASOV TEST SWITCH TO THE OFF POSITION. POSITION THE BUCKETS TO THE FULLY DEPLOYED REVERSE POSITION 73 DEG.

↓

CHECK THAT SWITCH SW2 OF THE BUCKET POSITION TRANSMITTER (INDICATOR) (36) IS CLOSED.
UTILIZE TEST POINT :
UT 1867-8A ENG 1
UT 1869-8A ENG 2
UT 1868-8A ENG 3
UT 1870-8A ENG 4
VOLTAGE SHOULD BE 28 VOLTS.

YES ↓ LOCATE AND RECTIFY DEFECT ON WIRING BETWEEN BUCKET POSITION TRANSMITTER (INDICATOR) (36) AND FLASHER UNIT (39).

NO → CHECK INTEGRITY OF FLEXIBLE SHAFT BETWEEN BUCKET BALLSCREW GEARBOX AND BUCKET POSITION TRANSMITTER (INDICATOR) (36). SATISFACTORY ?

NO → CHANGE FLEXIBLE SHAFT

YES ↓ CHANGE BUCKET POSITION TRANSMITTER (INDICATOR) (36)

CMS 71 00 51 1 SAMO

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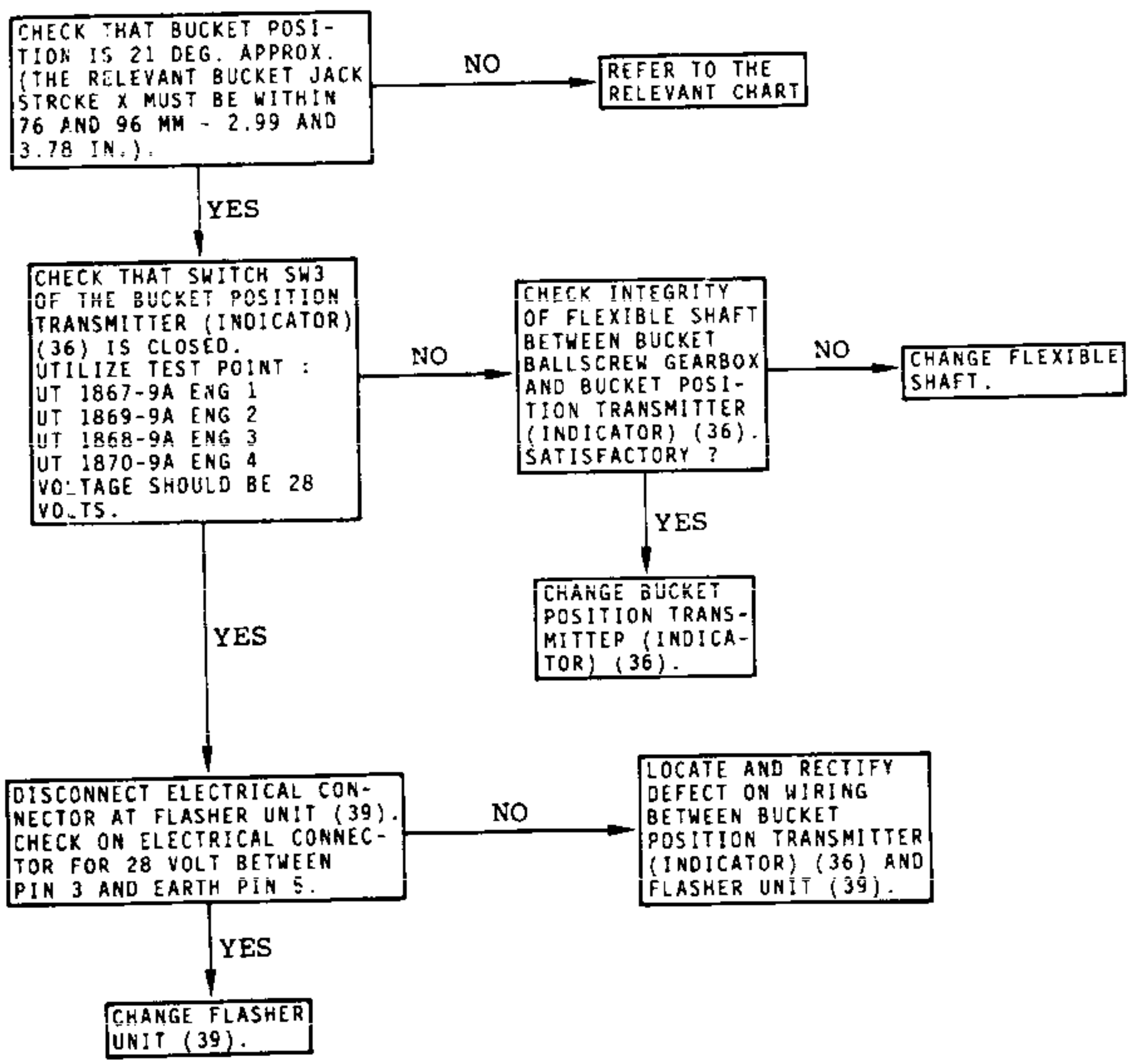
Chart 115

BLUE LIGHT DOES NOT EXTINGUISH WHEN BUCKETS REACH 21 DEG.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 28 VDC 115 V/400 HZ	
MULTIMETER	
BUCKET POSITION TRANSMITTER TEST BOX	9970-531-046
EXTENSION	9970-515-296



CMS 71 00 51 1 TAMO

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Chart 116

ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	WIRING DIAGRAM
ENGINE NO. 1							
1	Circuit breaker 28 V (PP. MGT LTS SUP)		5-213	1E461	D01	24-50-00	77-13-11
2	Circuit breaker 28 V (ALT THROT FAIL IND AND AJ MAX SUP)		3-213	1K6	B01	24-50-00	76-10-11
3	Circuit breaker 28 V (NASU 1 PROG CONT)		15-216	K1134	C09	24-50-00	76-11-44
4	Circuit breaker 28 V (REV THRUST CONT)		3-213	1K331	D01	24-50-00	78-30-11
5	Circuit breaker 28 V (REV THRUST ASOV CONT)		3-213	1K334	G03	24-50-00	78-30-11
6	Circuit breaker 115 V (NASU 1 SUP)		14-216	K1136	A07	24-50-00	78-30-31
7	Circuit breaker 28 V (NASU TEST SUP)		15-215	K1133	E17	24-50-00	78-30-31
8	Circuit breaker 115 V (BUCKET CONT UNIT SUP)		14-215	1K1132	E12	24-50-00	78-30-31
9	Circuit breaker 28 V (WIND DOWN		5-213	K1101	B01	24-50-00	76-11-91

	ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
		CONT SUP 1)						
	10	Circuit breaker 28 V (REV BUCKET POSN IND)		5-213	1E121	A03	24-50-00	78-30-51
	11	Forward thrust switch pack		9-211	1K1548		76-15-12	76-15-51
R	12	Reverse thrust switch pack		9-211	1K332		78-31-81	78-30-11
	17	Undercarriage weight switch						
	18	Wind down and air shut off valve test switch		27-214	K1105		76-00-00	76-11-92
	19	Take off monitoring "arm" switch (relay)		11-123	E579		77-13-00	77-13-11
R R	20	Undercarriage weight switch relay		2-123 3-123	G305 G310			
	21	Reverse select relay		19-123	1E463		77-13-00	77-13-11
	22	Bucket position 71 deg relay		19-123	1E566		78-30-00	78-30-51
	23	Aj min timing delay relay		19-123	1E560			78-30-51
	24	Air shut off		11-123	1K335		78-30-00	78-30-11

	ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
		valve locking relay						
	25	10 per cent throttle relay		19-123	1K727		76-00-00	76-15-51
	26	In flight reverse arm switch		1-214	E658			
R	27	Diode		19-123	1E128			78-30-51
	28	Wind down control relay		19-123	1E127			78-30-51
	29	Reverse baulk		9-211	1E123		76-11-17	78-30-51
	30	Forward baulk		9-211	1E124		76-11-17	78-30-51
	31	NASU (Nozzle angle scheduling unit)		10-215	1K1123		78-31-84	78-30-31
	32	NTRC (Bucket control unit)		10-215	1K1122		78-36-01	78-30-31
	33	BPDA (Bucket pneumatic drive actuator)		418	1K333		78-33-06	78-30-11
	34	Bucket ballscrew gearbox		417/418			78-32-19	
	35	Flexible shaft		415			78-34-01	
	36	Bucket position transmitter (in-		417	1K1107		78-35-01	76-11-91

	ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
		dicator)						
R	37	Crossfeed isolation valve		427	E575		78-37-01	77-13-21
R	38	Engine control unit		8-215 6-215	1K20 1K21			76-10-11
	39	Flasher unit		5-123	1E122		78-30-00	78-30-51
	40	Secondary nozzle indicator		1-214	1E552			78-30-91
	41	Primary nozzle area transducer		417	1E83		78-12-50	77-14-11
	42	Primary nozzle area indicator		6-211	1E82			77-14-11
R R R R	43	Electro-magnetic control valve		418	1K333C		78-33-06	78-30-11
	ENGINE NO. 2							
	1	Circuit breaker 28 V (PP. MGT LTS SUP)		1-213	2E461	E03	24-50-00	77-13-21
	2	Circuit breaker 28 V (ALT THROT FAIL IND AND AJ MAX SUP)		1-213	2K6	B03	24-50-00	76-10-21
	3	Circuit breaker 28 V (NASU 2 PROG CONT)		15-215	K1135	F17	24-50-00	77-11-44

ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	WIRING DIAGRAM
4	Circuit breaker 28 V (REV THRUST CONT)		1-213	2K331	B05	24-50-00	78-30-12
5	Circuit breaker 28 V (REV THRUST ASOV CONT)		1-213	2K334	D07	24-50-00	78-30-12
6	Circuit breaker 115 V (NASU 2 SUP)		13-215	K1137	B13	24-50-00	78-30-41
7	Circuit breaker 28 V (NASU TEST SUP)		15-215	K1133	E17	24-50-00	78-30-31
8	Circuit breaker 115 V (BUCKET CONT UNIT SUP)		13-215	2K1132	G14	24-50-00	78-30-41
9	Circuit breaker 28 V (WIND DOWN CONT SUP 1)		1-213	2K1101	F04	24-50-00	76-11-92
10	Circuit breaker 28 V (REV BUCKET POSN IND)		1-213	2E121	B07	24-50-00	78-30-61
11	Forward thrust switch pack		9-211	2K1548		76-15-12	76-15-53
12	Reverse thrust switch pack		9-211	2K332		78-31-81	78-30-12
17	Undercarriage weight switch						

	ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
	18	Wind down and air shut off valve test switch		27-214	K1104		76-00-00	76-11-91
	19	Take off monitoring "arm" switch (relay)		11-123	E579		76-13-00	77-13-11
R R	20	Undercarriage weight switch relay		2-123 3-123	G302 G318			
	21	Reverse select relay		19-123	2E463		77-13-00	77-13-31
	22	Bucket position 71 deg relay		19-123	2E566		78-30-00	78-30-61
	23	Aj min timing delay relay		19-123	2E560			78-30-61
	24	Air shut off valve locking relay		11-123	2K335		78-30-00	78-30-12
	25	10 per cent throttle relay		19-123	2K727		76-00-00	76-15-53
	26	In flight reverse arm switch		1-214	E658			
R	27	Diode		19-123	2E128			78-30-61
	28	Wind down control relay		19-123	2E127			78-30-61
	29	Reverse baulk		9-211	2E123		76-11-17	78-30-61

	ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
	30	Forward baulk		9-211	2E124		76-11-17	78-30-61
	31	NASU (Nozzle angle scheduling unit)		1-216	K1124		78-31-84	78-30-41
	32	NTRC (Bucket control unit)		10-215	2K1122		78-36-01	78-30-41
	33	BPDA (Bucket pneumatic drive actuator)		427	2K333		78-33-06	78-30-12
	34	Bucket ball-screw gearbox		427/428			78-32-19	
	35	Flexible shaft		425			78-34-01	
	36	Bucket position transmitter (indicator)		427	2K1107		78-35-01	76-11-92
R	37	Crossfeed isolation valve		427	E575		78-37-01	77-13-21
R	38	Engine control unit		6-215 8-215	2K20 2K21			76-10-21
	39	Flasher unit		5-123	2E122		78-30-00	78-30-61
	40	Secondary nozzle indicator		1-214	2E522			
	41	Primary nozzle area transducer		428	2E83		78-12-50	77-14-11
	42	Primary noz-		6-211	2E82			77-14-11

ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
	zle area indicator						
R 43	Electro-magnetic control valve		427	2K333C		78-33-06	78-30-12
R							
ENGINE NO. 3							
1	Circuit breaker 28 V (PP. MGT LTS SUP)		1-213	3E461	E04	24-50-00	77-13-31
2	Circuit breaker 28 V (ALT THROT FAIL IND AND AJ MAX SUP)		1-213	3K6	B04	24-50-00	76-10-31
3	Circuit breaker 28 V (NASU 2 PROG CONT)		15-215	K1135	F17	24-50-00	77-11-44
4	Circuit breaker 28 V (REV THRUST CONT)		1-213	3K331	B06	24-50-00	78-30-21
5	Circuit breaker 28 V (REV THRUST ASOV CONT)		1-213	3K334	D08	24-50-00	78-30-21
6	Circuit breaker 115 V (NASU 2 SUP)		13-215	K1137	B13	24-50-00	78-30-41
7	Circuit breaker 28 V (NASU TEST SUP)		15-215	K1133	E17	24-50-00	78-30-31
8	Circuit brea		13-216	3K1132	C06	24-50-00	78-30-41

ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
	ker 115 V (BUCKET CONT UNIT SUP)						
9	Circuit breaker 28 V (WIND DOWN CONT SUP 1)		1-213	3K1101	F05	24-50-00	76-11-93
10	Circuit breaker 28 V (REV BUCKET POSN IND)		1-213	3E121	B08	24-50-00	78-30-71
11	Forward thrust switch pack		9-211	3K1548		76-15-12	76-15-55
12	Reverse thrust switch pack		9-211	3K332		78-31-81	78-30-31
17	Undercarriage weight switch						
18	Wind down and air shut off valve test switch		27-214	K1104		76-00-00	76-11-91
19	Take off monitoring "arm" switch (relay)		11-123	E579		77-13-00	77-13-11
R 20	Undercarriage weight switch relay		2-123 3-123	G300 G315			
R 21	Reverse select relay		20-123	3E463		77-13-00	77-13-31
R 22	Bucket position 71 deg		20-123	3E566		78-30-00	78-30-31

	ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
		relay						
R	23	Aj min timing delay relay		20-123	3E560			78-30-71
	24	Air shut off valve locking relay		11-123	3K335		78-30-00	78-30-21
	25	10 per cent throttle relay		20-123	2E461		76-00-00	77-13-21
	26	In flight reverse arm switch		1-214	E658			
R	27	Diode		20-123	3E128			78-30-71
	28	Wind down control relay		19-123	3E127			78-30-71
	29	Reverse baulk		9-211	3E123		76-11-17	78-30-71
	30	Forward baulk		9-211	3E124		76-11-17	78-30-71
	31	NASU (Nozzle angle scheduling unit)		1-216	K1124		78-31-84	78-30-41
	32	NTRC (Bucket control unit)		1-216	3K1122		78-36-01	78-30-41
R	33	BPDA (Bucket pneumatic drive actuator)		438	3K333		78-33-06	78-30-21
	34	Bucket ballscrew gearbox		437/438			78-32-19	

	ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
	35	Flexible shaft		435			78-34-01	
	36	Bucket position transmitter (indicator)		437	3K1107		78-35-01	76-11-93
R	37	Crossfeed isolation valve		447	E576		78-37-01	77-13-31
R	38	Engine control unit		8-216 6-216	3K20 3K21			76-10-31
	39	Flasher unit		5-123	3E122		78-30-00	78-30-71
	40	Secondary nozzle indicator		1-214	3E552			78-30-91
	41	Primary nozzle area transducer		437	3E83		78-12-50	77-14-11
	42	Primary nozzle area indicator		6-211	3E82			77-14-11
R	43	Electro-Magnetic control valve		438	3K333C		78-33-06	78-30-21
	ENGINE NO. 4							
	1	Circuit breaker 28 V (PP. MGT LTS SUP)		5-213	4E461	D02	24-50-00	77-13-31
	2	Circuit breaker 28 V (ALT THROT FAIL IND AND AJ MAX SUP)		3-213	4K6	B02	24-50-00	76-10-41

ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
3	Circuit brea ker 28 V (NASU 1 PROG CONT)		15-216	K1134	C09	24-50-00	76-11-44
4	Circuit brea ker 28 V (REV THRUST CONT)		3-213	4K331	D02	24-50-00	78-30-22
5	Circuit brea ker 28 V (REV THRUST ASOV CONT)		3-213	4K334	G04	24-50-00	78-30-22
6	Circuit brea ker 115 V (NASU 1 SUP)		14-216	K1136	A07	24-50-00	78-30-31
7	Circuit brea ker 28 V (NASU TEST SUP)		15-215	K1133	E17	24-50-00	78-30-31
8	Circuit brea ker 115 V (BUCKET CONT UNIT SUP)		14-216	4K1132	C06	24-50-00	78-30-31
9	Circuit brea ker 28 V (WIND DOWN CONT SUP 1)		5-213	4K1101	B02	24-50-00	76-11-94
10	Circuit brea ker 28 V (REV BUCKET POSN IND)		5-213	4E121	A04	24-50-00	78-30-81
11	Forward thrust switch pack		9-211	4K1548		76-15-12	76-15-57
12	Reverse thrust		9-211	4K332		78-31-81	78-30-22

	ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
		switch pack						
	17	Undercarriage weight switch						
	18	Wind down and air shut off valve test switch		27-214	K1105		76-00-00	76-11-92
	19	Take off monitoring "arm" switch (relay)		11-123	E579		77-13-00	77-13-11
R R	20	Undercarriage weight switch relay		2-123 3-123	G309 G314			
R	21	Reverse select relay		20-123	4E463		77-13-00	77-13-41
R	22	Bucket position 71 deg relay		20-123	4E566		78-30-00	78-30-81
R	23	Aj min timing delay relay		20-123	4E560			78-30-81
	24	Air shut off valve locking relay		11-123	4K335		78-30-00	78-30-22
	25	10 per cent throttle relay		20-123	4K727		76-00-00	76-15-57
	26	In flight reverse arm switch		1-214	E658			
R	27	Diode		20-123	4E128			78-30-81

	ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
R	28	Wind down control relay		20-123	4E127			78-30-81
	29	Reverse baulk		9-211	4E123		76-11-17	78-30-81
	30	Forward baulk		9-211	4E124		76-11-17	78-30-81
	31	NASU (Nozzle angle scheduling unit)		10-215	K1123		78-31-84	78-30-31
	32	NTRC (Bucket control unit)		1-216	4K1122		78-36-01	78-30-31
R	33	BPDA (Bucket pneumatic drive actuator)		447	4K333		78-33-06	78-30-22
	34	Bucket ball-screw gearbox		447/448			78-32-19	
	35	Flexible shaft		445			78-34-01	
	36	Bucket position transmitter (indicator)		447	4K1107		78-35-01	76-11-94
R	37	Crossfeed isolation valve		447	E576		78-37-01	77-13-31
R	38	Engine control unit		6-216 8-216	4K20 4K21			76-10-41
	39	Flasher unit		5-123	4E122		78-30-00	78-30-81
	40	Secondary nozzle indi-		1-214	4E552			78-30-91

ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT TOPIC	MANUAL REF. WIRING DIAGRAM
	cator						
41	Primary noz-zle area transducer		448	4E83		78-12-50	77-14-11
42	Primary noz-zle area indicator		6-211	4E82			77-14-11
R 43	Electro-magne-tic control valve		447	4K333C		78-33-06	78-30-22

Component Identification

R 4. List of the Trouble Shooting Charts

R Chart 101 - Secondary Nozzle Indicator does not show 18 deg
R 30 to 23 deg 30 and Buckets are in correct
R position (21 degrees approximately).

R Chart 102 - Modulation failure.

R Chart 103 - Buckets position is 27 degrees approximately.

R Chart 104 - System erratic in travel.

R Chart 105 - Buckets do not move toward thrust reverse
R position.

R Chart 106 - Time excessive for travel.

R Chart 107 - "CON" caption illuminates in reverse.

R Chart 108 - Buckets are at 73 deg approx. but reverse baulk
R has not been removed to enable the lever to move
R fully rearward.

R Chart 109 - Buckets do not return to forward thrust position.

R Chart 110 - In flight reverse travel time of buckets exceeds
R 3.5 seconds.

R Chart 111 - Air shut-off valve safety circuit malfunction.

R Chart 112 - Mechanical malfunction.

R Chart 113 - Buckets reach 21 deg. approx. but forward thrust
R not available (forward baulk engaged).

R Chart 114 - Blue light does not flash during transit.

R Chart 115 - Blue light does not go steady at end of travel
R when buckets reach 73 deg.

R Chart 116 - Blue light does not extinguish when buckets reach
R 21 deg.

HP FUEL SHUT-OFF VALVE CONTROL - TROUBLE SHOOTING

1. General

A. The HP valve control system comprises an HP valve switch, two solenoids (engine start and engine shut-down) within the flow control unit, and engine shut-down handle and two HP valve relays.

The electrical supply is 28 V d.c. and the circuit contains one circuit breaker.

B. Although the trouble shooting charts contained in this chapter are complete in their entirety, the HP valve control system is associated with other systems during the engine start phase. Cross references have therefore been provided on the charts and also on the charts of the associated systems.

C. Operation of the engine shut-down handle results on the contacts of the HP valve control switch being by-passed and a voltage supply sent direct to the engine shut-down solenoid in the flow control unit to energise the HP valve relay.

D. Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is detailed in Table 101.

2. Preparation

A. Ensure that external electrical power is connected and switched ON.

B. Consult Chart 101 and carry out the actions indicated to determine which of the trouble shooting charts is applicable.

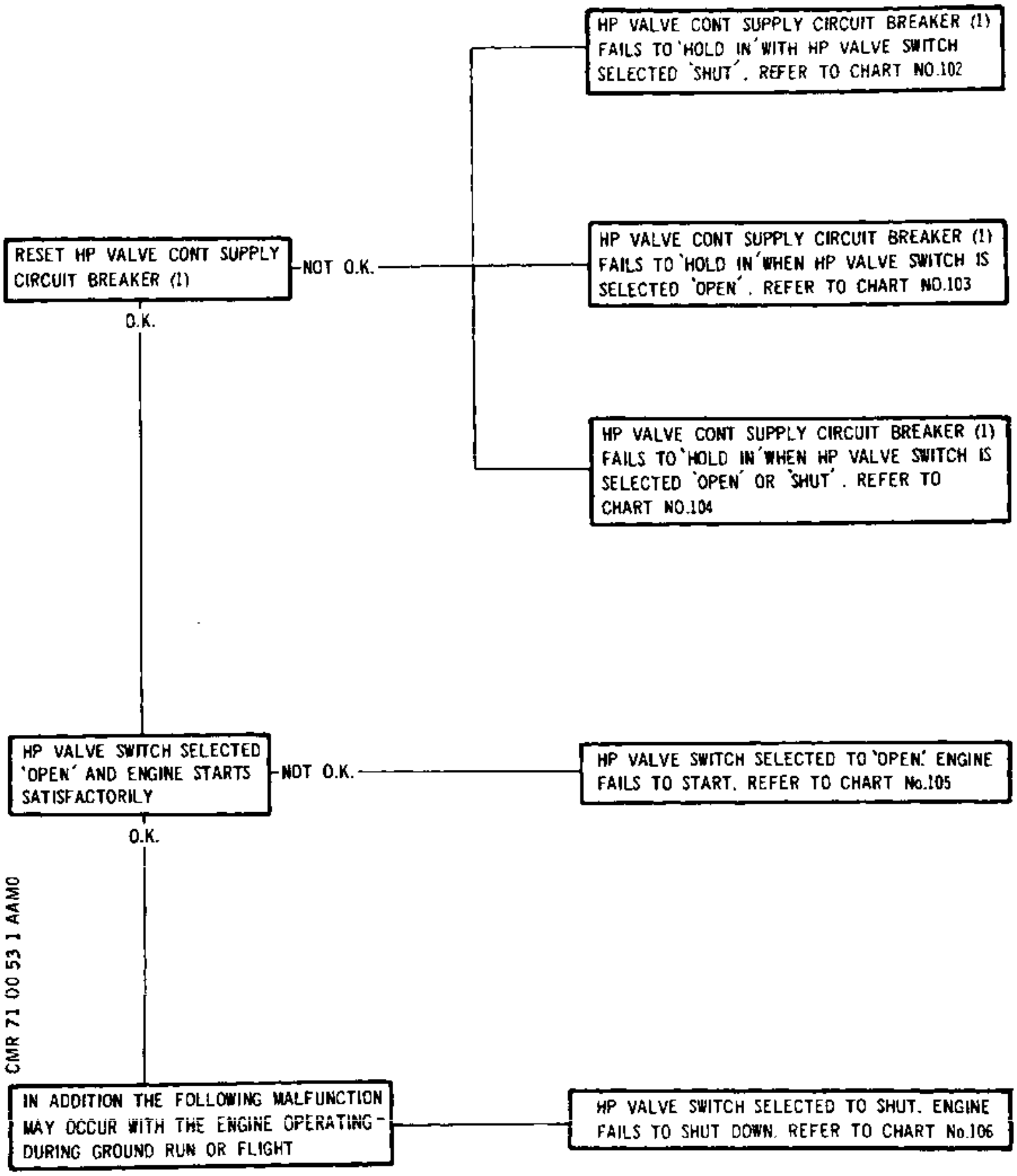
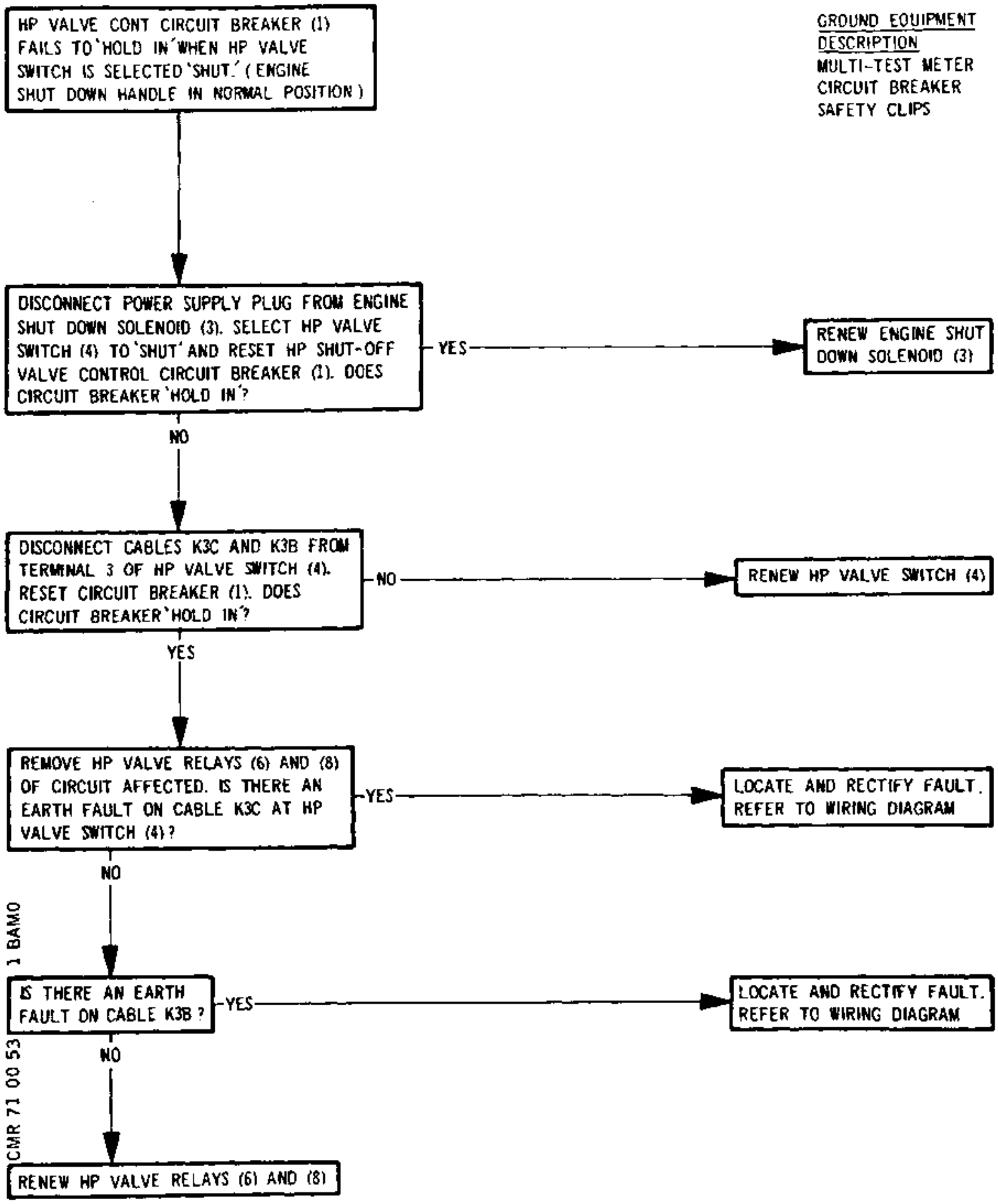

RESET HP VALVE CONT SUPPLY CIRCUIT BREAKER (1)
NOT O.K.
O.K.
HP VALVE CONT SUPPLY CIRCUIT BREAKER (1) FAILS TO 'HOLD IN' WITH HP VALVE SWITCH SELECTED 'SHUT'. REFER TO CHART NO.102
HP VALVE CONT SUPPLY CIRCUIT BREAKER (1) FAILS TO 'HOLD IN' WHEN HP VALVE SWITCH IS SELECTED 'OPEN'. REFER TO CHART NO.103
HP VALVE CONT SUPPLY CIRCUIT BREAKER (1) FAILS TO 'HOLD IN' WHEN HP VALVE SWITCH IS SELECTED 'OPEN' OR 'SHUT'. REFER TO CHART NO.104
HP VALVE SWITCH SELECTED 'OPEN' AND ENGINE STARTS SATISFACTORILY
NOT O.K.
O.K.
HP VALVE SWITCH SELECTED TO 'OPEN' ENGINE FAILS TO START. REFER TO CHART No.105
IN ADDITION THE FOLLOWING MALFUNCTION MAY OCCUR WITH THE ENGINE OPERATING - DURING GROUND RUN OR FLIGHT
HP VALVE SWITCH SELECTED TO SHUT. ENGINE FAILS TO SHUT DOWN. REFER TO CHART No.106
CMR 71 00 53 1 AAM0

Chart 101

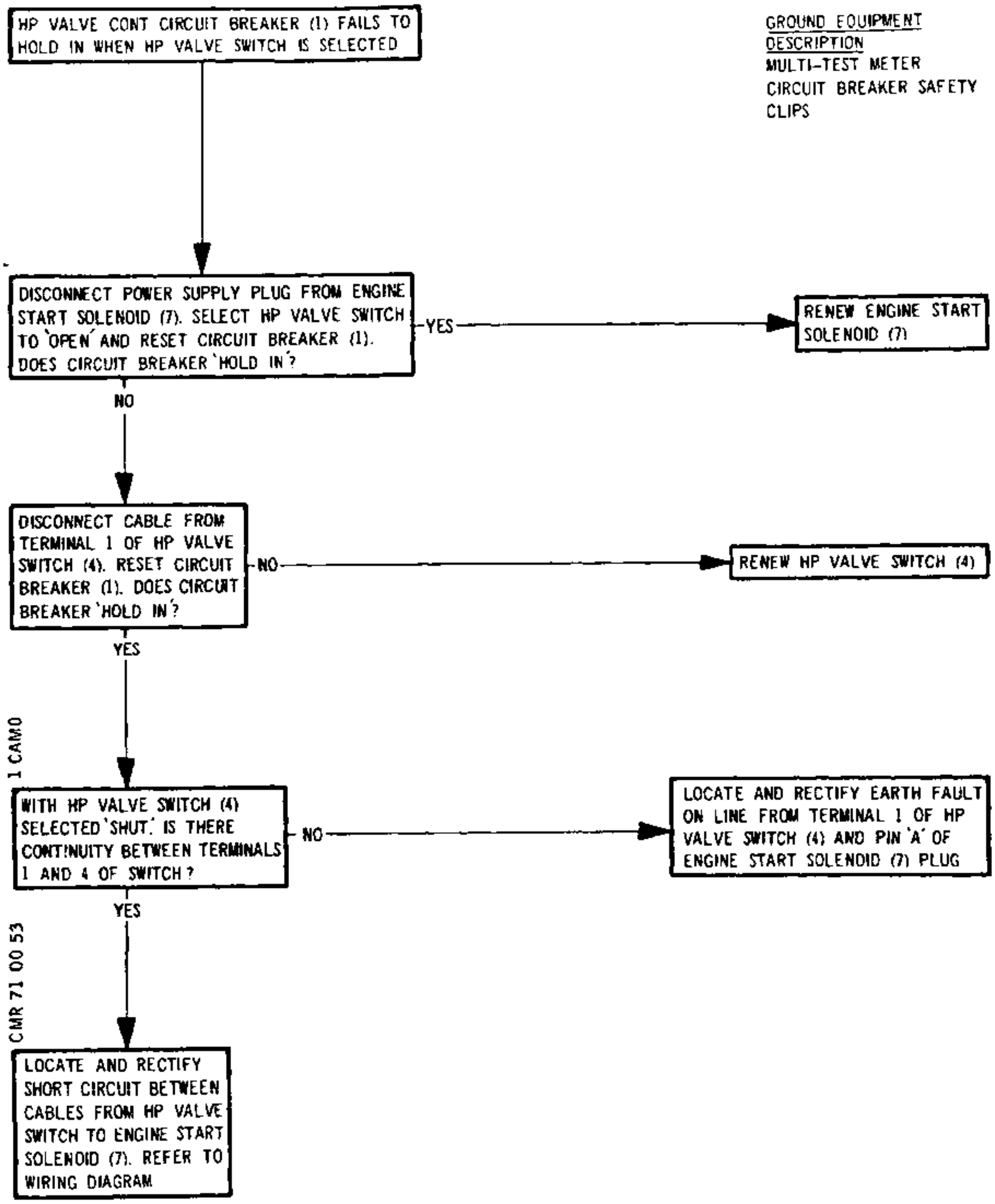
GROUND EQUIPMENT DESCRIPTION
MULTI-TEST METER
CIRCUIT BREAKER
SAFETY CLIPS



CMR 71 00 53 1 BAMO

Chart 102

GROUND EQUIPMENT DESCRIPTION
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS

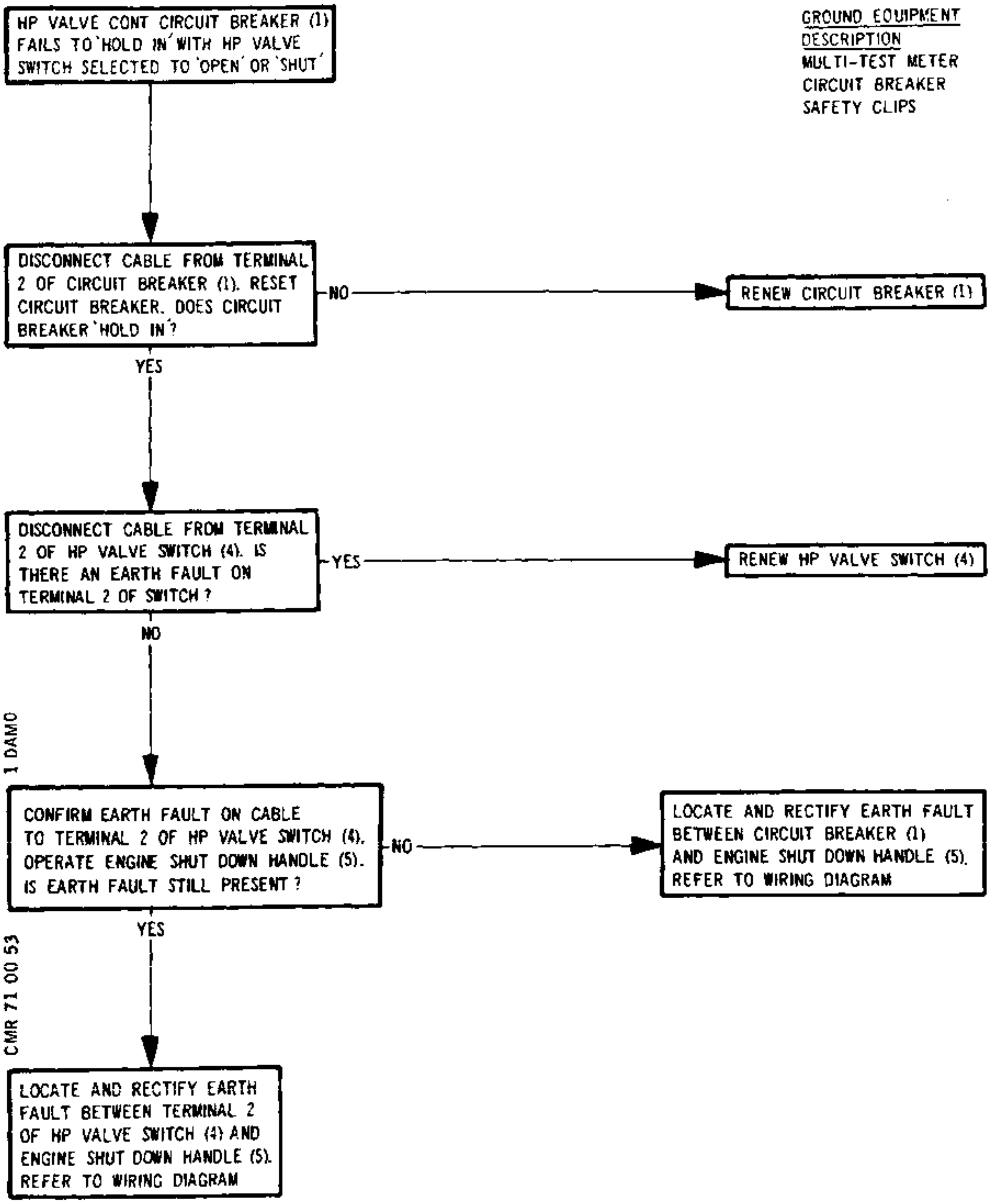


1 CAM0

CMR 71 00 53

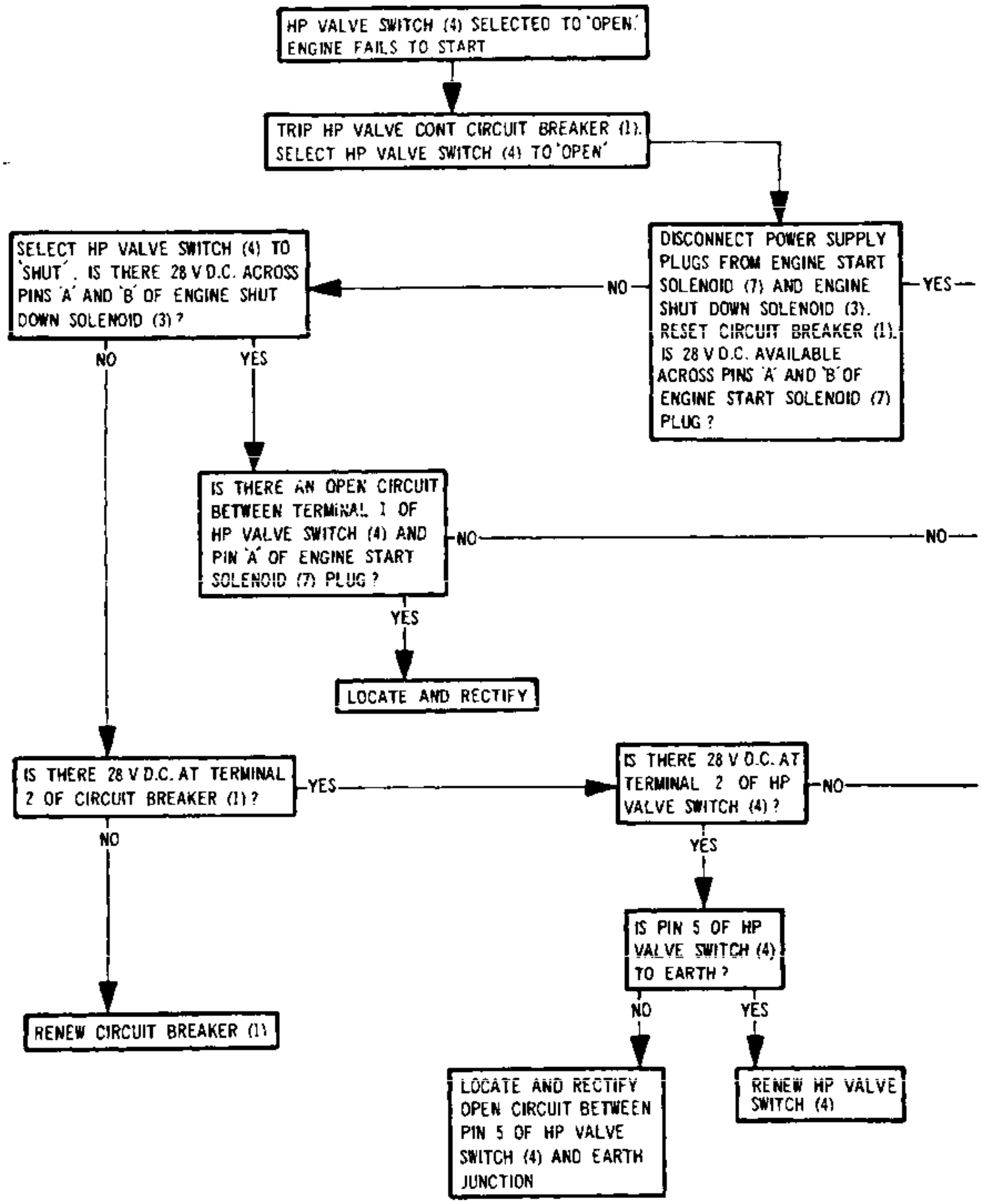
Chart 103

GROUND EQUIPMENT DESCRIPTION
MULTI-TEST METER
CIRCUIT BREAKER
SAFETY CLIPS



1 DAMO
CMR 71 00 53

Chart 104



CMR 71 00 53 1 EAMA

Chart 105 (Sheet 1 of 2)

GROUND EQUIPMENT
DESCRIPTION
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS

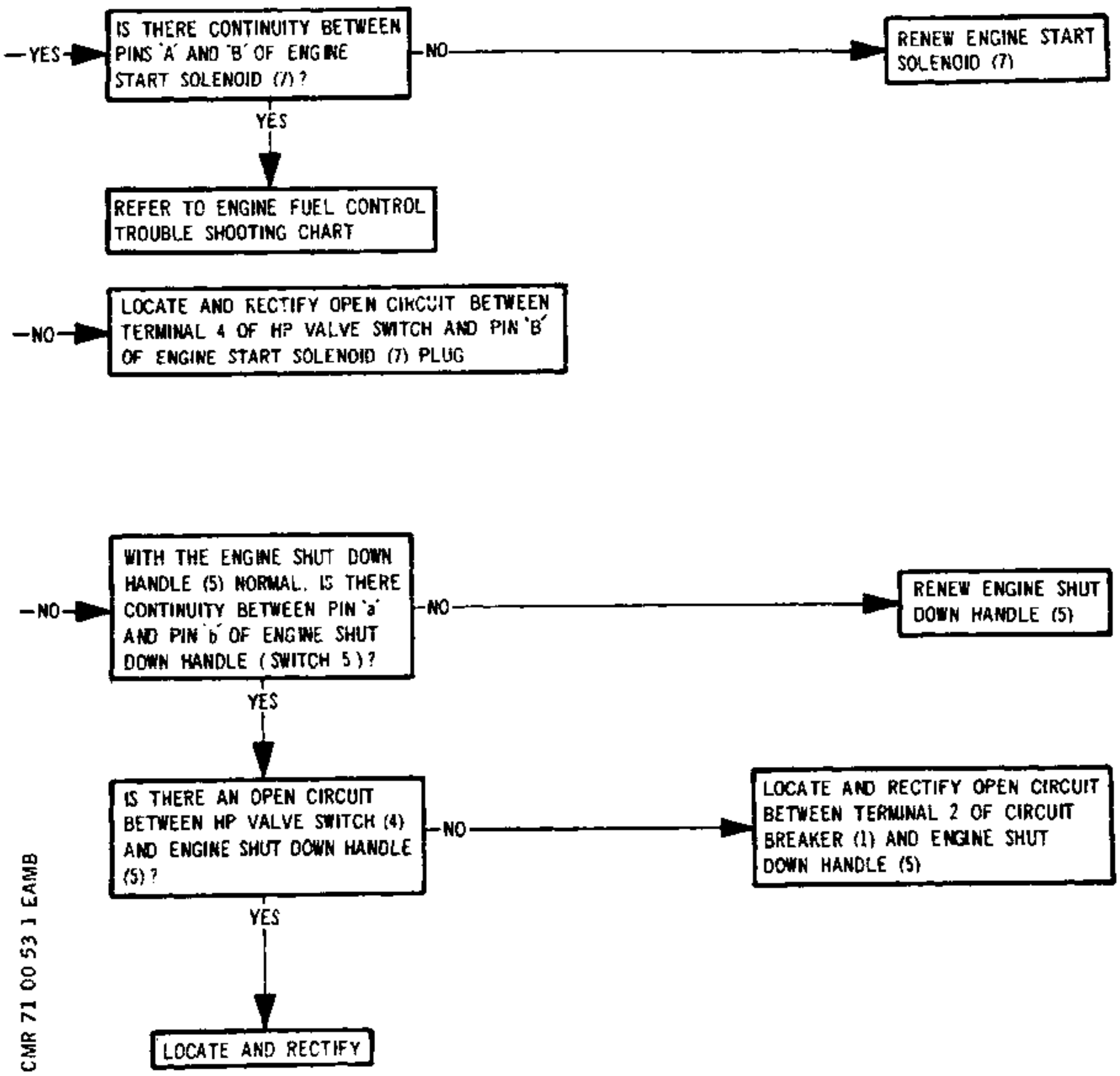


Chart 105 (Sheet 2 of 2)

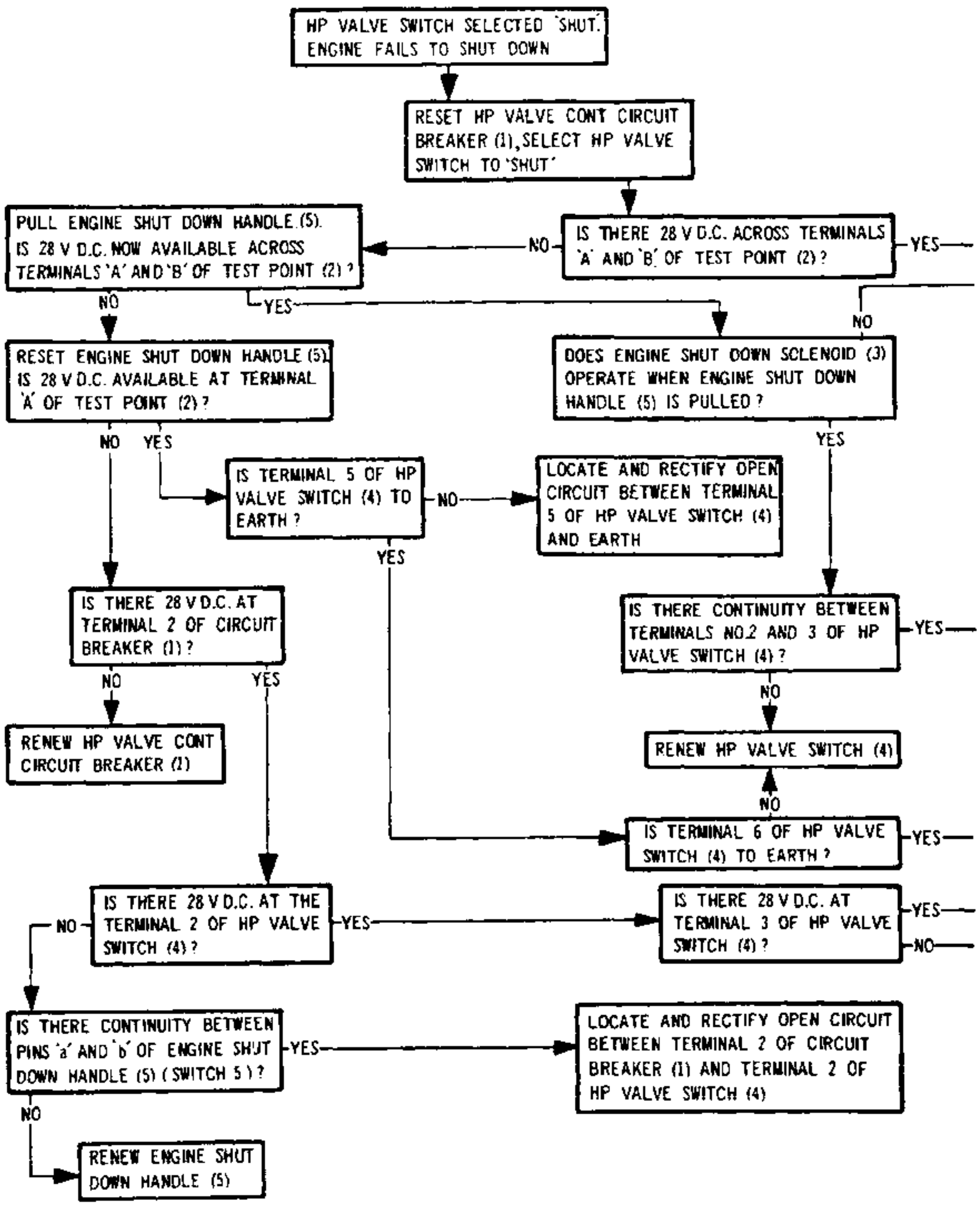


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Chart 106 (Sheet 1 of 2)

GROUND EQUIPMENT

DESCRIPTION

MULTI-TEST METER
CIRCUIT BREAKER
SAFETY CLIPS

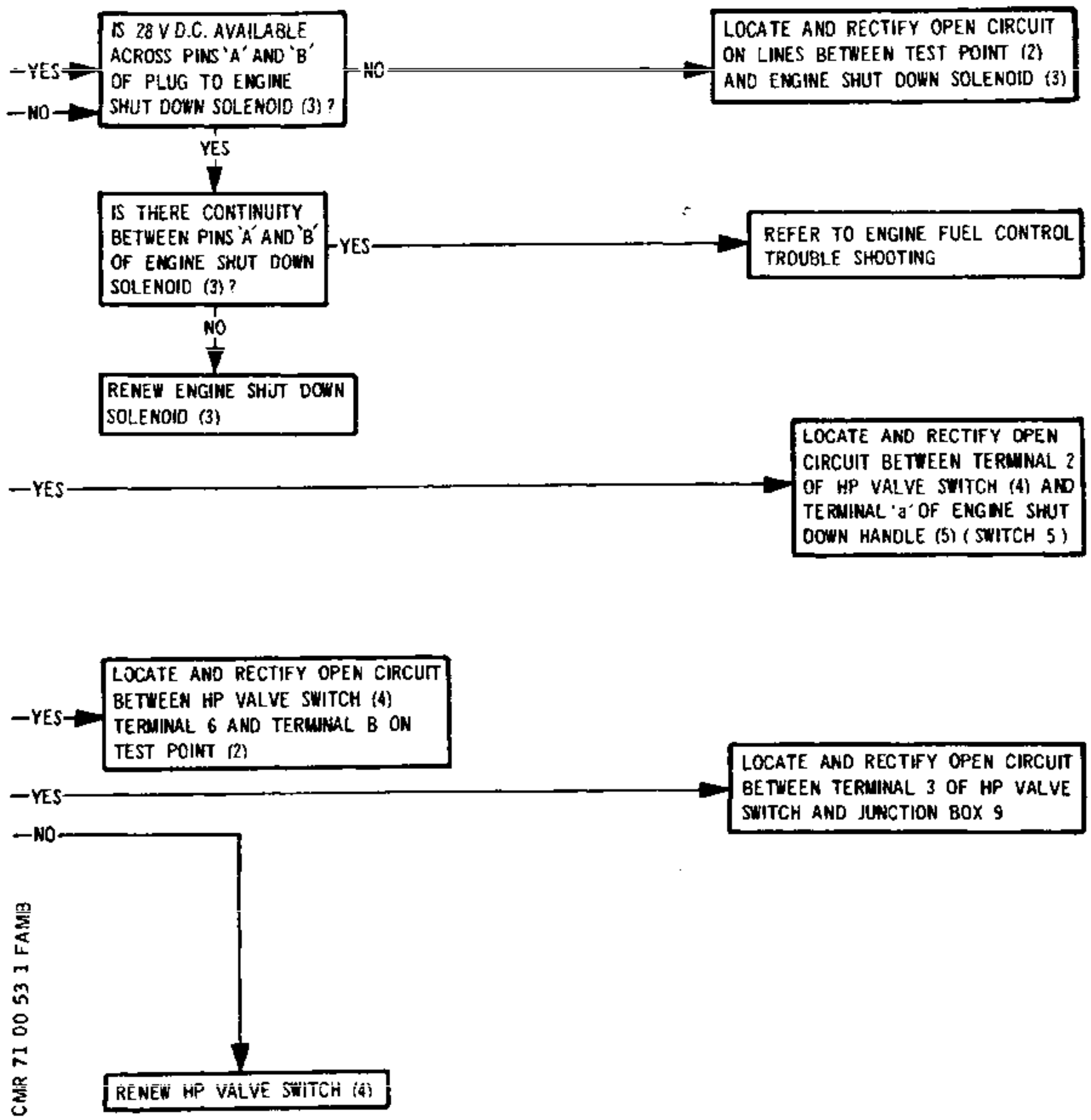

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Chart 106 (Sheet 2 of 2)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF MAINT. TOPIC	MANUAL REF WIRING DIAGRAM
ENGINE NO. 1						
(1) Circuit breaker 28 V	-	3-213	1K131	Map Ref.C1		
(2) Test point	-	19-123	UT1867	-	73-00-00	
(3) Engine shut-down solenoid	-	415	-	-	73-21-01	
(4) HP valve switch	-	4-211	1K132	-	73-00-00	
(5) Engine shut-down handle	-	4-211	1W160	-	26-22-00	
(6) HP valve relay	-	19-123	1K134	-	73-00-00	
(7) Engine start solenoid	-	415	-	-	73-21-01	
(8) HP valve relay	-	19-123	1K133	-	73-00-00	
(9) Junction box	-	19-123	UM1875	-	73-00-00	
ENGINE NO. 2						
(1) Circuit breaker 28 V	-	1-123	2K131	Map ref.C3		
(2) Test point	-	19-123	UT1869	-	73-00-00	
(3) Engine shut down solenoid	-	425	-	-	73-21-01	
(4) HP valve switch	-	4-211	2K132	-	73-00-00	
(5) Engine shut-down handle	-	4-211	2W160	-	26-22-00	
(6) HP valve	-	19-123	2K134	-	73-00-00	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF MAINT. TOPIC	MANUAL REF WIRING DIAGRAM
ENGINE NO. 1 relay						
(7) Engine start solenoid	-	425	-	-	73-21-01	
(8) HP valve relay	-	19-123	2K133	-	73-00-00	
(9) Junction box	-	19-123	UM1877	-	73-00-00	
ENGINE NO. 3						
(1) Circuit breaker 28 V	-	1-213	3K131	Map Ref.C4		
(2) Test point	-	20-123	UT1868	-	73-00-00	
(3) Engine shut-down solenoid	-	435	-	-	73-21-01	
(4) HP valve switch	-	4-211	3K132	-	73-00-00	
(5) Engine shut-down handle	-	4-211	3W160	-	26-22-00	
(6) HP valve relay	-	20-123	3K134	-	73-00-00	
(7) Engine start solenoid	-	435	-	-	73-21-01	
(8) HP valve relay	-	20-123	3K133	-	73-00-00	
(9) Junction box	-	20-123	UM1876	-	73-00-00	
ENGINE NO. 4						
(1) Circuit breaker 28 V	-	3-213	4K131	Map Ref.C2		

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF MAINT. TOPIC	MANUAL REF WIRING DIAGRAM
ENGINE NO. 1						
(2) Test point	-	20-123	UT1870	-	73-00-00	
(3) Engine shut-down solenoid	-	445	-	-	73-21-01	
(4) HP valve switch	-	4-211	4K132	-	73-00-00	
(5) Engine shut-down handle	-	4-211	4W160	-	26-22-00	
(6) HP valve relay	-	20-123	4K134	-	73-00-00	
(7) Engine start solenoid	-	445	-	-	73-21-01	
(8) HP valve relay	-	20-123	4K133	-	73-00-00	
(9) Junction box	-	20-123	UM1878	-	73-00-00	

Component Identification
Table 101

WIND DOWN CONTROL SYSTEM - TROUBLE SHOOTING

1. General

R The automatic wind down circuit reduces engine power to a
R minimum should the buckets move away from their selected
R positions.

Faults are dealt with on a probability basis and identified as a result of testing. They can also develop on the ground or during flight.

The defect can be isolated with the aid of the trouble shooting procedures (Ref. para.3), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectiviation action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 102). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, and that electrical power is available, unless otherwise stated. If the fault is not recitifed, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 102).

2. Preparation

A. Ensure that circuit breakers listed in Table 101 are set.

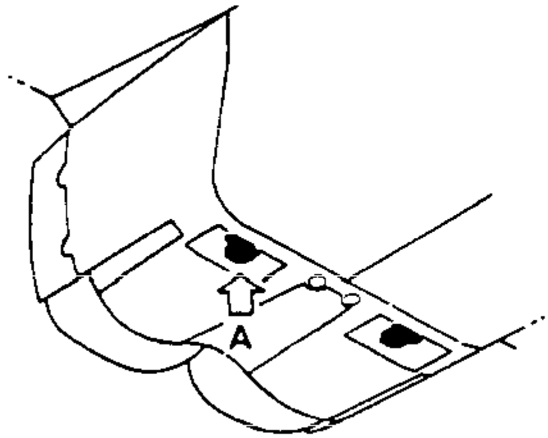
B. Ensure that external power supply is connected.

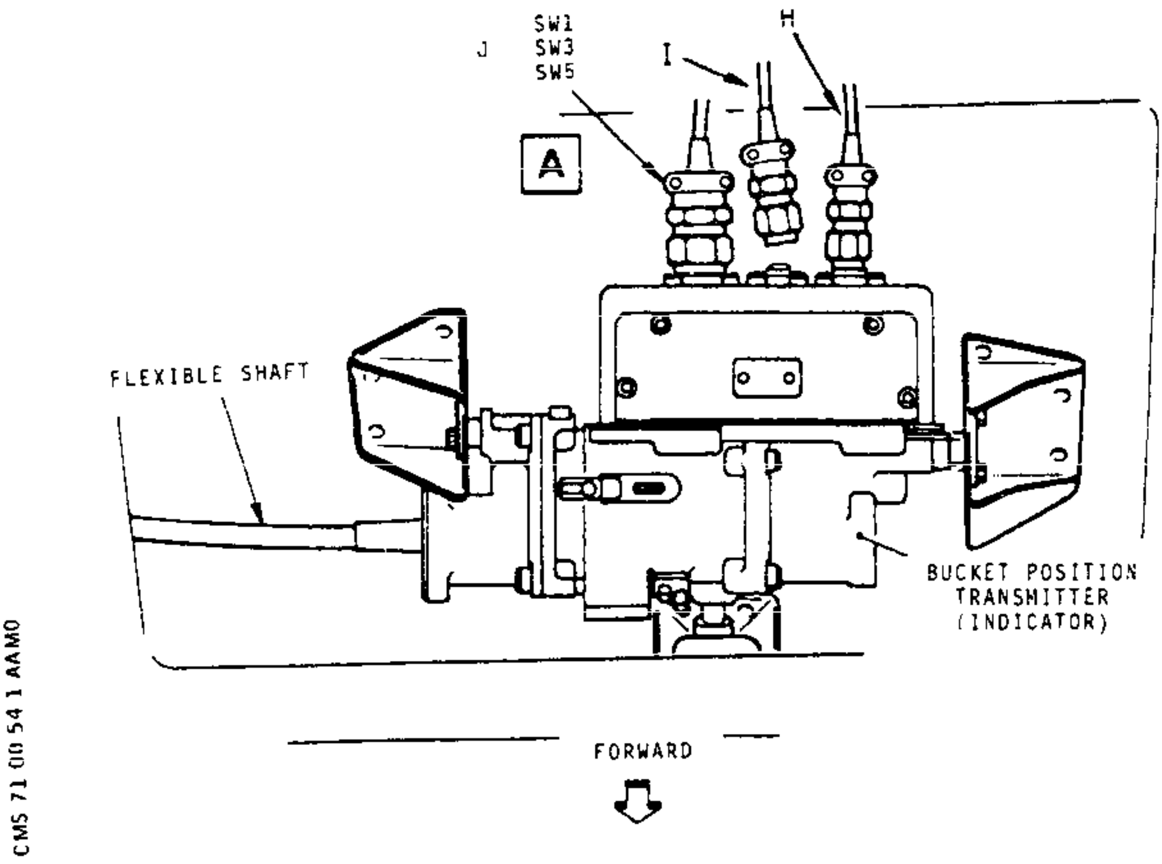
C. Switch on electrical ground power (Ref.24-41-00).

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
WIND DOWN CONT SUP 1	5-213	1K 1101	B 1
WIND DOWN CONT SUP 2	1-213	1K 1108	C 7
WIND DOWN IND	5-213	1K 1102	B 3

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
REV BUCKET POSN IND	5-213	1E 121	A 3
Engine No. 2			
WIND DOWN CONT SUP 1	1-213	2K 1101	F 4
WIND DOWN CONT SUP 2	5-213	2K 1108	C 1
WIND DOWN IND	1-213	2K 1102	F 6
REV BUCKET POSN IND	1-213	2E 121	B 7
Engine No. 3			
WIND DOWN CONT SUP 1	1-213	3K 1101	F 5
WIND DOWN CONT SUP 2	5-213	3K 1108	C 2
WIND DOWN IND	1-213	3K 1102	F 7
REV BUCKET POSN IND	1-213	3E 121	B 8
Engine No. 4			
WIND DOWN CONT SUP 1	5-213	4K 1101	B 2
WIND DOWN CONT SUP 2	5-213	4K 1108	C 8
WIND DOWN IND	5-213	4K 1102	B 4
REV BUCKET POS IND	5-213	4E 121	A 4

Circuit Breakers
Table 101





Bucket Position Transmitter (Indicator)
Figure 101

3. Trouble Shooting

A. PREPARE TO TROUBLE SHOOT (REF. PARA. 2)
POSITION THE THROTTLE LEVER FULLY FORWARD IN ITS GATE WITH THRUST REVERSE LEVER FULLY DOWN.
SELECT THROTTLE MASTER MAIN.
POSITION NOZ AIR SOV AND WIND DOWN TEST SWITCH TO OFF.
CHECK THAT WIND-DOWN CAPTION DOES NOT ILLUMINATE.

NO → WIND DOWN CAPTION ILLUMINATES BUT GOES OUT WHEN THROTTLE MASTER ALTERNATE SELECTED : CHANGE ECU MAIN (4)

YES ↓

B. SELECT THROTTLE MASTER ALTERN.
CHECK THAT WIND-DOWN CAPTION DOES NOT ILLUMINATE.

NO → CHANGE ECU ALTERNATE (5)

YES ↓

C. RETURN THROTTLE MASTER SELECTOR TO MAIN.
MOVE NOZ AIR SOV AND WIND DOWN TEST SWITCH TO POSITION B AND CHECK THAT WIND DOWN CAPTION ILLUMINATES.
NOTE : REV CAPTION ILLUMINATES

NO ↓

SELECT THROTTLE MASTER ALTERN AND CHECK THAT WIND DOWN CAPTION ILLUMINATES.
1. SATISFACTORY : CHANGE ECU MAIN (4)
2. NOT OK : CHART 101

YES ↓

CONTINUED ON PAGE 105

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R

CONTINUED FROM PAGE 104

D. SELECT THROTTLE MASTER ALTERN AND CHECK THAT WIND DOWN CAPTION ILLUMINATES.

NO

CHANGE ECU ALTERNATE (5)

YES

E. RETURN THROTTLE MASTER SELECTOR TO MAIN WITH NOZ AIR SOV AND WIND DOWN TEST SWITCH TO POSITION C AND CHECK THAT WIND DOWN CAPTION GOES OUT.

NO

SUSPECT WIND DOWN CONTROL RELAY (6) NOT ENERGISING.

YES

F. MOVE REVERSE THRUST LEVER TO REVERSE IDLE (HARD AGAINST REVERSE BAULK) AND CHECK THAT WIND DOWN CAPTION REMAINS OUT.

NO

CHECK FOR RIGGING OF SWITCH SW4 ON REVERSE LEVER SWITCH PACK. SHOULD BE OPEN.

NO

CHECK FOR RIGGING OF REVERSE LEVER SWITCH PACK (9). CHANGE IF NECESSARY.

YES

CHECK RIGGING OF SW11 IN FORWARD THRUST LEVER SWITCH PACK. SHOULD BE OPEN.

YES

CONTINUED ON PAGE 106

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R

CONTINUED FROM PAGE 105

G. WITH NOZ AIR SOV AND WIND DOWN TEST SWITCH AT POSITION B, MOVE REVERSE THRUST LEVER FULLY REARWARD AND CHECK THAT WIND DOWN CAPTION ILLUMINATES.

NO

CHECK FOR RIGGING OF SWITCH SW4 ON REVERSE LEVER SWITCH PACK (9). SHOULD BE CLOSED.

YES

H. RETURN THROTTLE LEVER TO FORWARD THRUST POSITION, FULLY FORWARD IN ITS GATE AND NOZ AIR SOV AND WIND DOWN TEST SWITCH TO POSITION OFF.
MOVE BUCKETS TO ANGULAR POSITION Z = 50 to 55 DEG BY HANDCRANKING THE BUCKET BALLSCREW GEARBOX DRIVER. THE RELEVANT BUCKET JACK STROKE X IS WITHIN 206 AND 231 MM (8.11 AND 9.09 IN.).
CHECK THAT WIND DOWN CAPTION ILLUMINATES.

NO

IS BLUE REVERSE LIGHT FLASHING ? (SWITCH 3 IN BUCKET POSITION TRANSMITTER SHOULD BE OPEN).

YES

CHECK FOR RIGGING OF SWITCH SW1 IN BUCKET POSITION TRANSMITTER. SHOULD BE CLOSED (CONNECTOR J FIG. 101).
USE BUCKET POSITION TRANSMITTER TEST BOX No. 9970-531-046.
IF NOT OK : CHANGE BUCKET POSITION TRANSMITTER (7).

NO

CHANGE BUCKET POSITION TRANSMITTER (7)

YES

CONTINUED ON PAGE 107

CMS 71 00 54 1 BAMC

CONTINUED FROM PAGE 106

I. POSITION THE REVERSE LEVER FULLY REARWARD WITH NOZ AIR SOV AND WIND DOWN TEST SWITCH TO POSITION OFF.
CHECK THAT WIND DOWN CAPTION IS OUT.

NO

CHECK SW11 IN FORWARD THRUST LEVER SWITCH PACK.
SHOULD BE OPEN

YES

J. MOVE BUCKETS TO 73 DEG., HARD AGAINST STOPS, BY HANDCRANKING THE BUCKET BALLSCREW GEARBOX DRIVER.
CHECK THAT WIND DOWN CAPTION REMAINS OUT.

NO

CHECK FOR RIGGING OF SWITCH SW5 IN BUCKET POSITION TRANSMITTER.
(CONNECTOR J FIG. 101).
SHOULD BE OPEN. USE BUCKET POSITION TRANSMITTER TEST BOX No. 9970-531-046
IF NOT OK : CHANGE BUCKET POSITION TRANSMITTER (7).

YES

K. RETURN THE BUCKETS TO 70 DEG BY HANDCRANKING THE BUCKET BALLSCREW GEARBOX DRIVER BY 13 REVOLUTIONS.
CHECK THAT WIND DOWN CAPTION ILLUMINATES.

NO

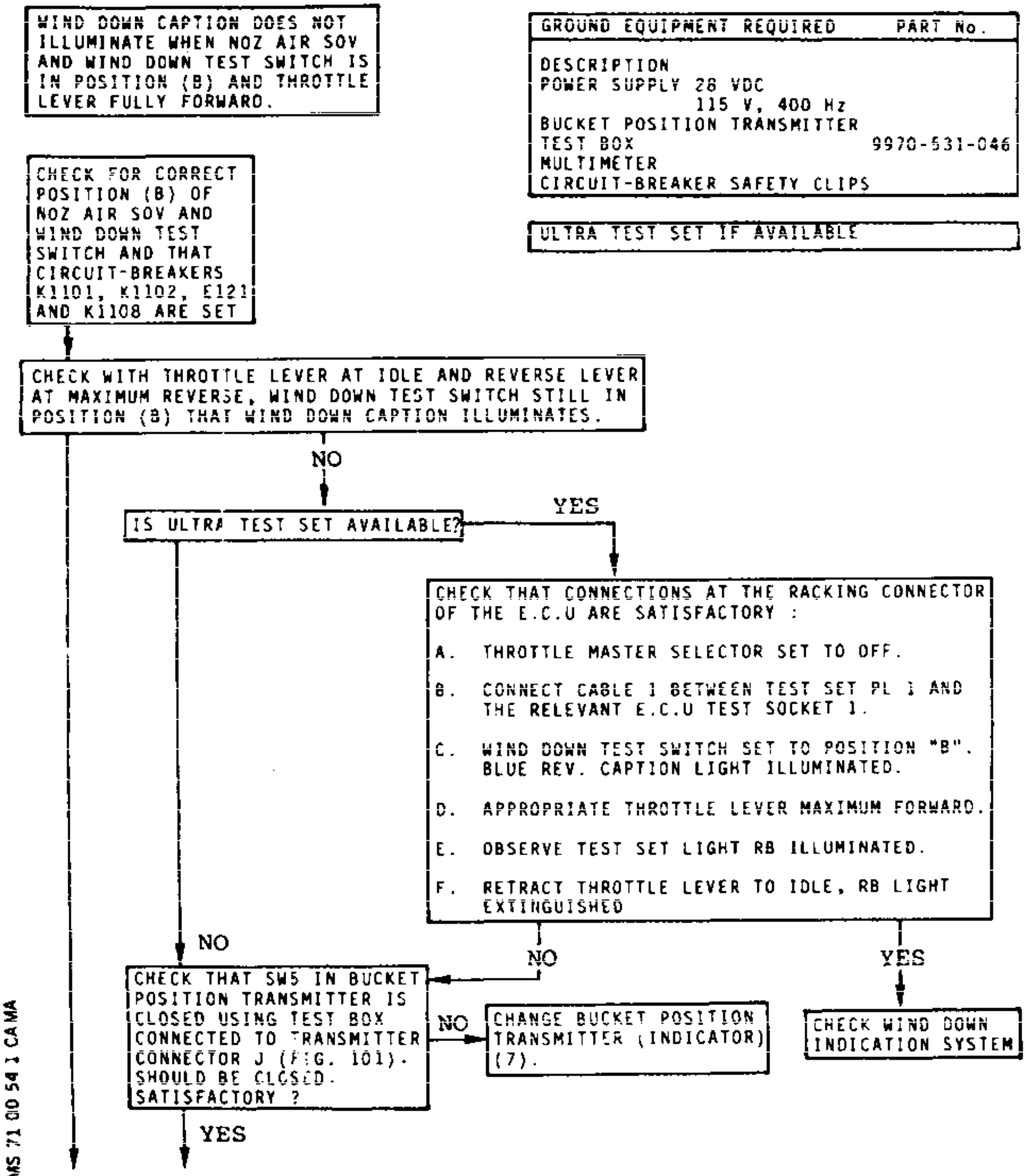
CHECK FOR RIGGING OF SWITCH SW5 IN BUCKET POSITION TRANSMITTER. SHOULD BE CLOSED.
USE BUCKET POSITION TRANSMITTER TEST BOX No. 9970-531-046
IF NOT OK : CHANGE BUCKET POSITION TRANSMITTER (7).

END OF PROCEDURE

CMS 71 00 54 1 BAMD

GROUND EQUIPMENT REQUIRED	PART No.
DESCRIPTION	
POWER SUPPLY 28 VDC	
115 V, 400 Hz	
BUCKET POSITION TRANSMITTER TEST BOX	9970-531-046
MULTIMETER	
CIRCUIT-BREAKER SAFETY CLIPS	

ULTRA TEST SET IF AVAILABLE

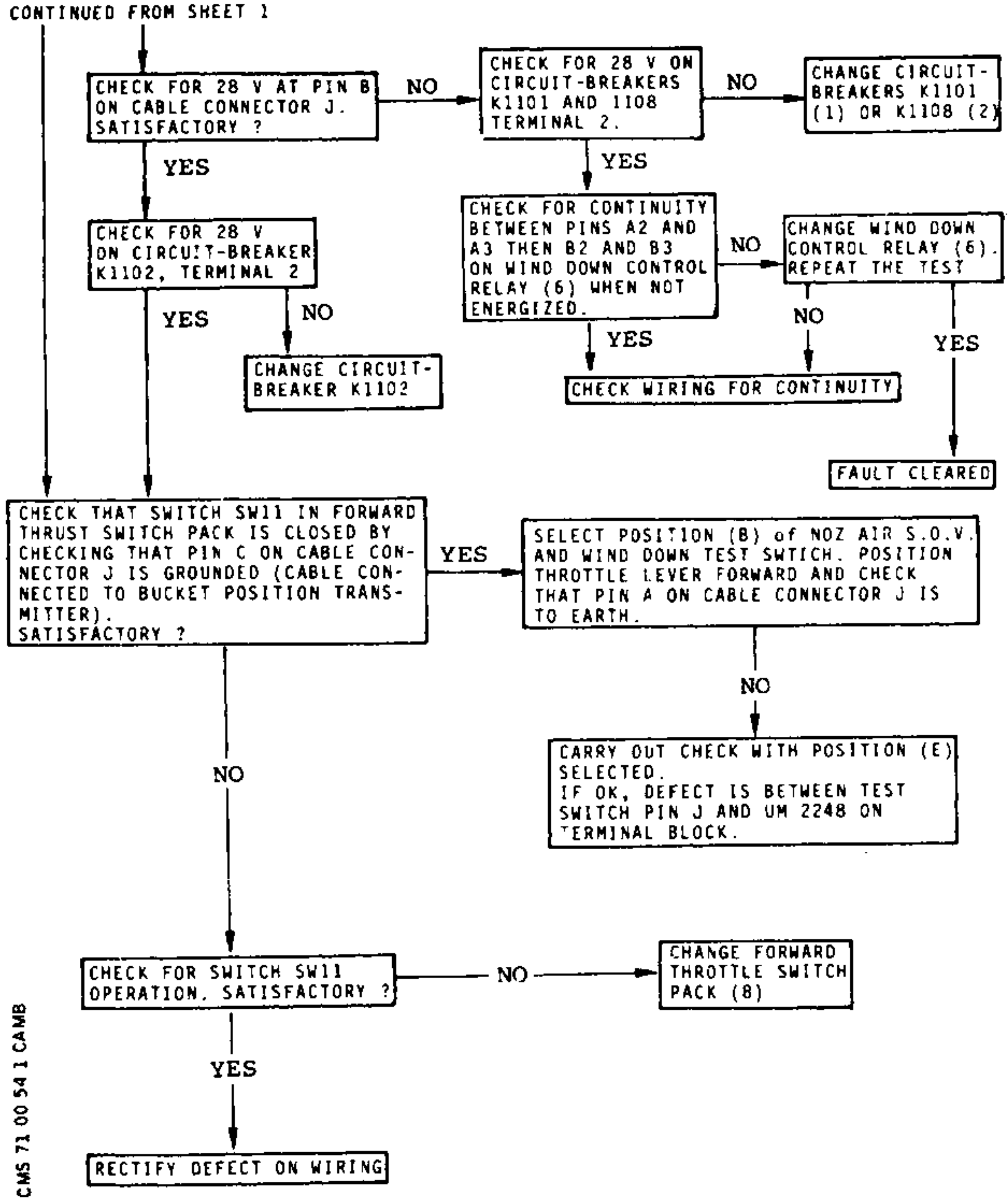


CONTINUED ON SHEET 2

CMS 71 00 54 1 CAMA

R

Chart 101 (Sheet 1 of 2)



R

Chart 101 (Sheet 2 of 2)

ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MAINT TOPIC	WIRING DIAGRAM
ENGINE No. 1							
1	Circuit brea ker 28 V (WIND DOWN CONT SUP 1)		5-213	1K1101	B 1	24-50-00	76-11-91
2	Circuit brea ker 28 V (WIND DOWN CONT SUP 2)		1-213	1K1108	C 7	24-50-00	76-11-91
3	Circuit brea ker 28 V (WIND DOWN IND)		5-213	1K1102	B 3	24-50-00	76-11-91
4	Engine control unit (E.C.U.) main		8-215	1K20		76-11-00	76-11-91
5	Engine control unit (E.C.U.) Alternate		6-215	1K21		76-11-00	76-11-91
6	Wind down control relay		19-123	1E127			76-11-91
7	Bucket position transmitter (indicator)		417	1K1107		78-35-01	76-11-91
8	Forward thrust throttle switch pack		9-211	1K1548		76-15-12	76-15-51
9	Reverse thrust throttle switch pack		9-211	1K332		78-31-81	78-30-11
10	WIND DOWN and A.S.O.V. test switch		27-214	K1104		77-13-00	76-11-92
ENGINE No. 2							

ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MAINT TOPIC	WIRING DIAGRAM
1	Circuit brea ker 28 V (WIND DOWN CONT SUP 1)		1-213	2K1101	F 4	24-50-00	76-11-92
2	Circuit brea ker 28 V (WIND DOWN CONT SUP 2)		5-213	2K1108	C 1	24-50-00	76-11-92
3	Circuit brea ker 28 V (WIND DOWN IND)		1-213	2K1102	F 6	24-50-00	76-11-92
4	Engine control unit (E.C.U.) main		6-215	2K20		76-11-00	76-11-92
5	Engine control control (E.C.U.) Alternate		8-215	2K21		76-11-00	76-11-92
6	WIND DOWN control relay		19-123	2E127			76-11-92
7	Bucket position transmitter (indicator)		427	2K1107		78-35-01	76-11-92
8	Forward thrust throttle switch pack		9-211	2K1548		76-15-12	76-15-53
9	Reverse thrust throttle switch pack		9-211	2K332		78-31-81	78-30-12
10	WIND DOWN and A.S.O.V. test switch		27-214	K1105		77-13-00	76-11-91
ENGINE No. 3							
1	Circuit brea ker 28 V		1-213	3K1101	F 5	24-50-00	76-11-93

ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MAINT TOPIC	WIRING DIAGRAM
	(WIND DOWN CONT SUP 1)						
2	Circuit brea ker 28 V (WIND DOWN CONT SUP 2)		5-213	3K1108	C 2	24-50-00	76-11-93
3	Circuit brea ker 28 V (WIND DOWN IND)		1-213	3K1102	F 7	24-50-00	76-11-93
4	Engine control unit (E.C.U.) main		8-216	3K20		76-11-00	76-11-93
5	Engine control unit (E.C.U.) alternate		6-216	3K21		76-11-00	76-11-93
6	WIND DOWN control relay		20-213	3E127			76-11-93
7	Bucket position transmitter (indicator)		437	3K1107		78-35-01	76-11-93
8	Forward thrust throttle switch pack		9-211	3K1548		76-15-12	76-15-55
9	Reverse thrust throttle switch pack		9-211	3K332		78-31-81	78-30-31
10	WIND DOWN and A.S.O.V. test switch		27-214	K1105		77-13-00	76-11-91
ENGINE No. 4							
1	Circuit brea ker 28 V (WIND DOWN CONT SUP 1)		5-213	4K1101	B 2	24-50-00	76-11-94

ITEM	DESCRIPTION	ACCESS PANEL	EQUIP. ZONE	EQUIP. IDENT.	POSITION	MAINT TOPIC	WIRING DIAGRAM
2	Circuit breaker 28 V (WIND DOWN CONT SUP 2)		1-213	4K1108	C 8	24-50-00	76-11-94
3	Circuit breaker 28 V (WIND DOWN IND)		5-213	4K1102	B 4	24-50-00	76-11-94
4	Engine control unit (E.C.U.) main		6-216	4K20		76-11-00	76-11-94
5	Engine alternat control unit (E.C.U.) Alternate		8-216	4K21		76-11-00	76-11-94
6	WIND DOWN control relay		20-123	4E127			76-11-94
7	Bucket position transmitter (indicator)		447	4K1107		78-35-01	76-11-94
8	Forward thrust throttle switch pack		9-211	4K1548		76-15-12	76-15-57
9	Reverse thrust throttle switch pack		9-211	4K332		78-31-81	78-30-22
10	WIND DOWN and A.S.O.V. test switch		27-214	K1104		77-13-00	76-11-92

Component Identification
Table 102

HP FUEL SHUT-OFF VALVE INDICATION - TROUBLE SHOOTING

1. General

   A. The HP valve position indication system provides flight compartment indication of the position of the HP shut-off valve via a magnetic indicator. Also, when the HP shut-off valve is selected 'OPEN' and the engine shut-down handle is operated, a light on the HP valve switch illuminates.

   B. The electrical supply to the system is via a 26 V a.c. and a 28 V d.c. circuit breaker, one pair of circuit breakers serving engines No.1 and 4, and one pair serving engines No.2 and 3.

   C. In the event of a circuit breakers failing to hold in, it is necessary at an early stage of trouble shooting to establish which engine system the defect is in.

      Failures in the magnetic indicator circuit (with the exception of a short circuit) will not affect operation of the HP valve switch light circuit and vice versa.

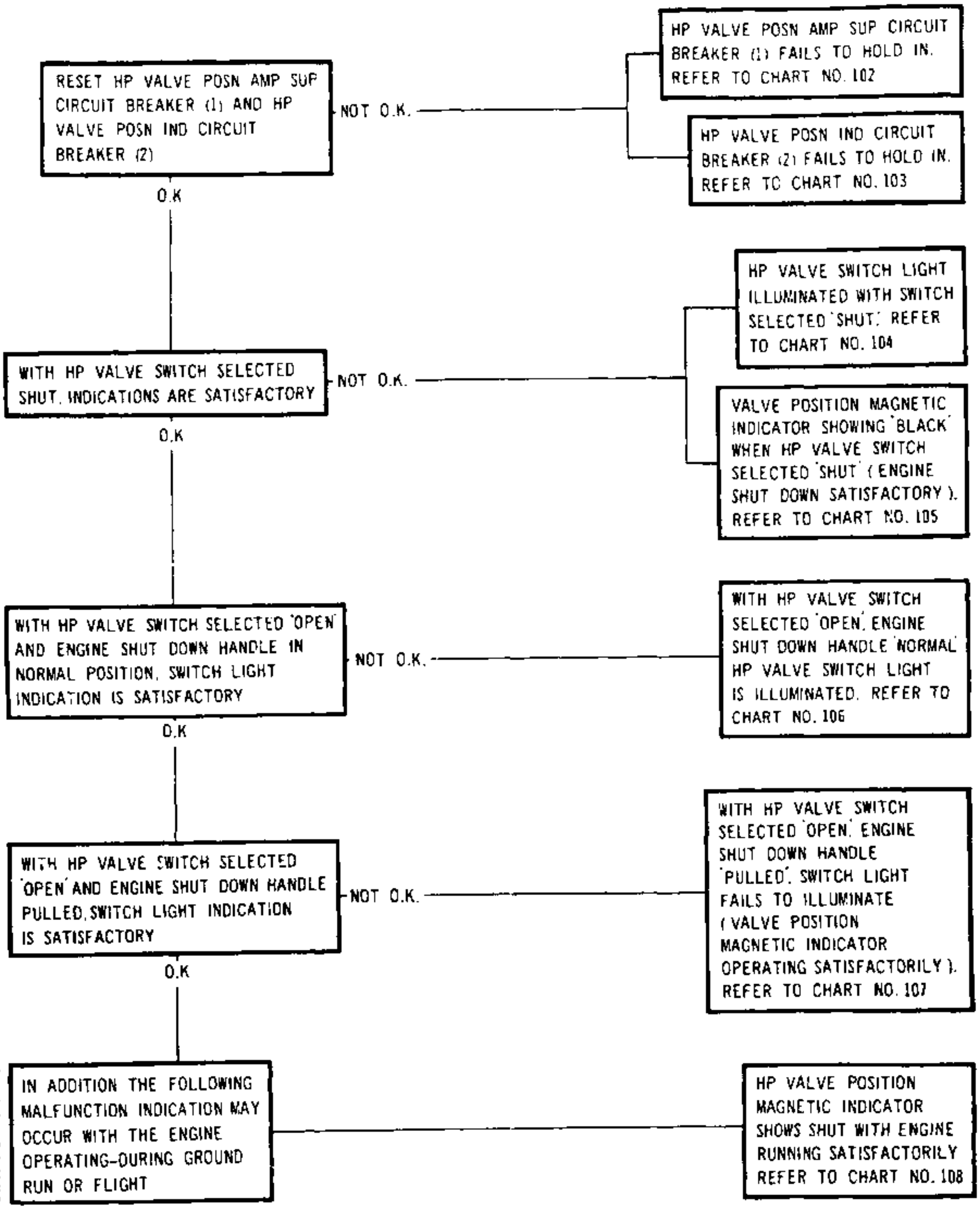
   D. Should the LP shaft signal system operate during ground run or flight the engine will automatically shut down and the HP valve position magnetic indicator will show 'SHUT'.

   E. Identification of circuit breakers and components indicated by numbers in parenthesis in the charts is detailed in Table 101.

2. Preparation

   A. Ensure that external electrical power supply is connected and switched on.

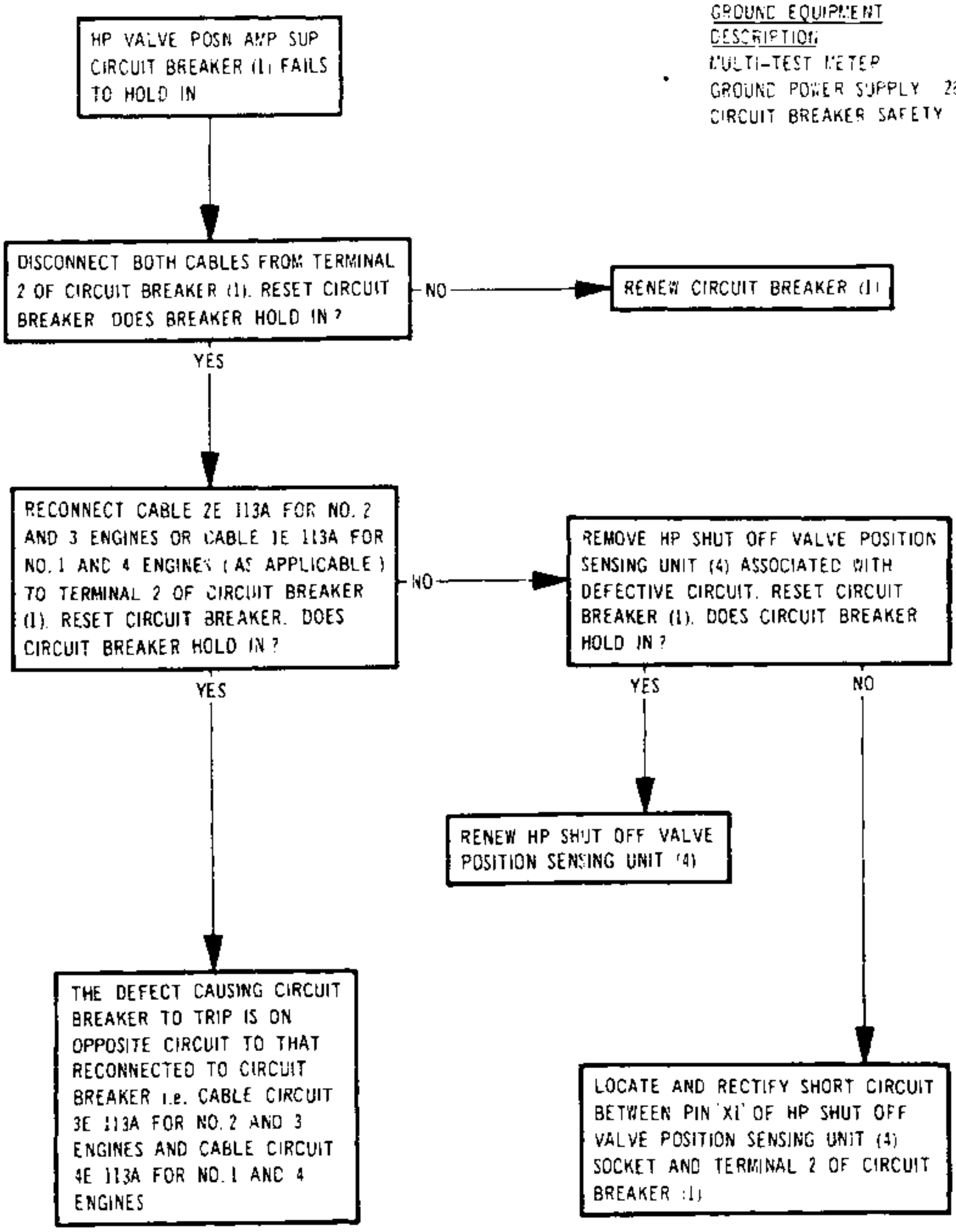
   B. Consult Chart 101 and carry out the actions indicated to determine which of the trouble shooting charts is applicable.



CMR 71 00 55 1 AAM0

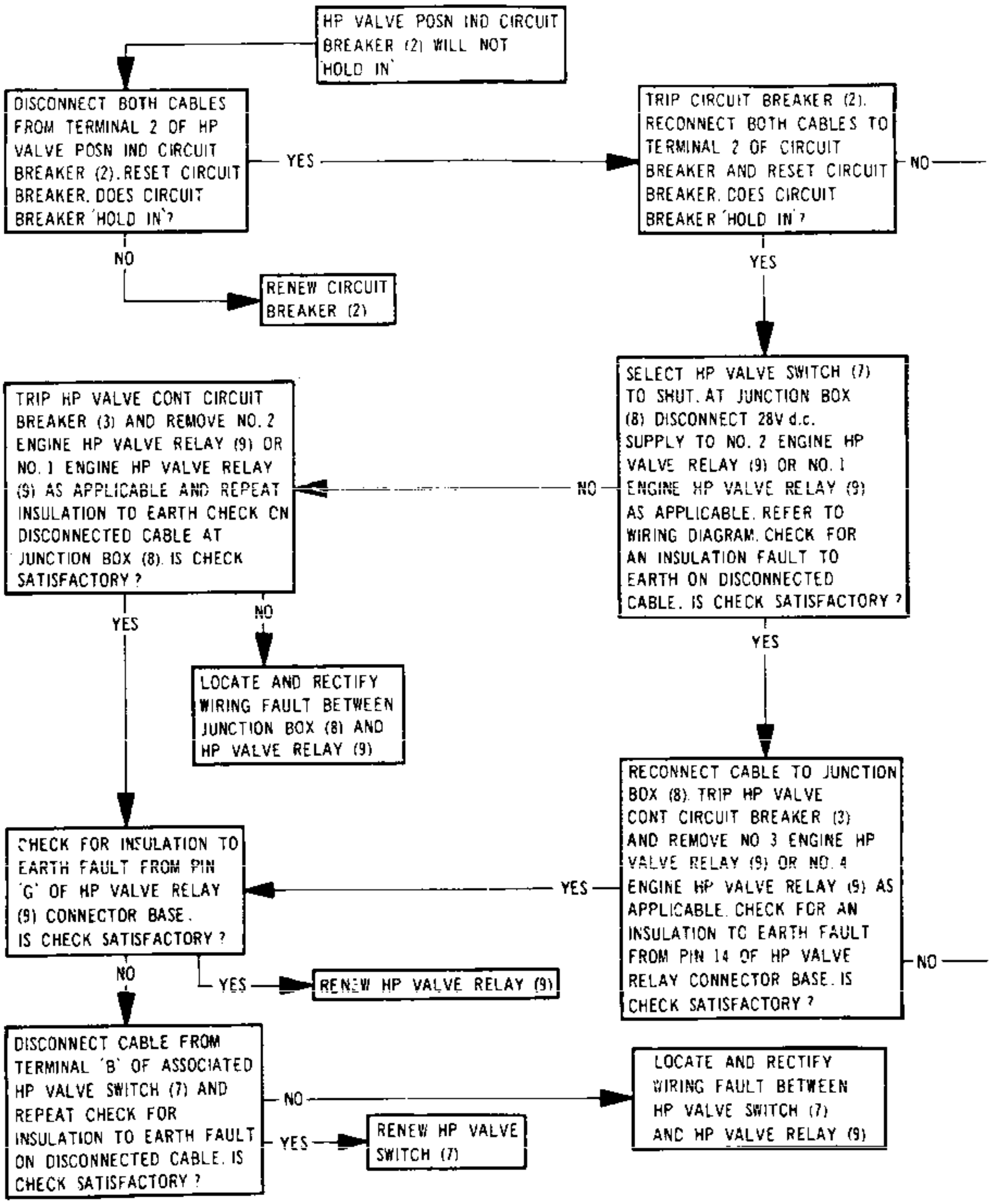
Chart 101

GROUND EQUIPMENT
DESCRIPTION
MULTI-TEST METER
GROUND POWER SUPPLY (28 V d.c.)
CIRCUIT BREAKER SAFETY CLIPS



CMR 71 00 55 1 BAMO

Chart 102



CMR 71 00 55 1 CAMA

Chart 103 (Sheet 1 of 2)

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GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY 28V d.c.
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS

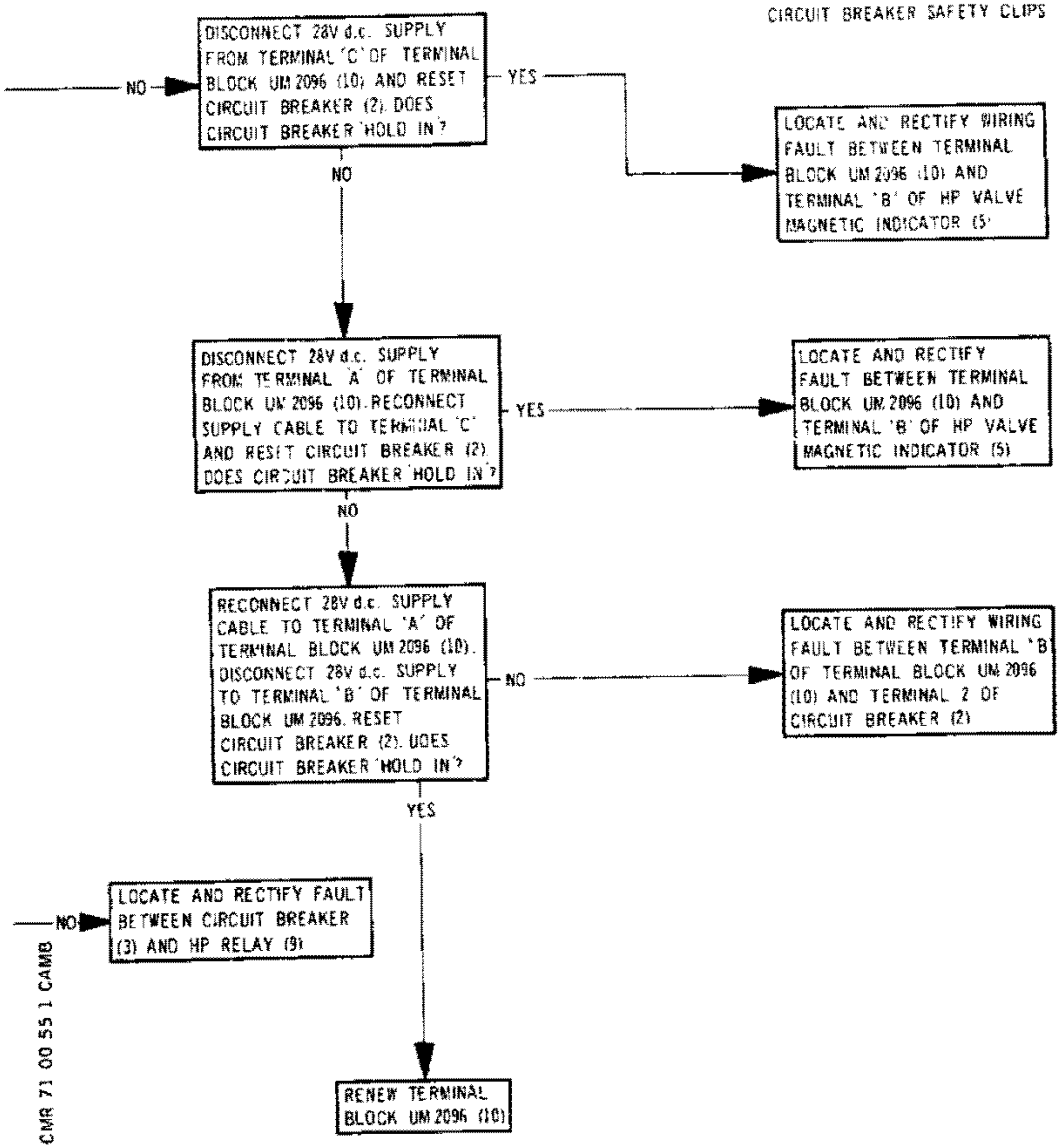
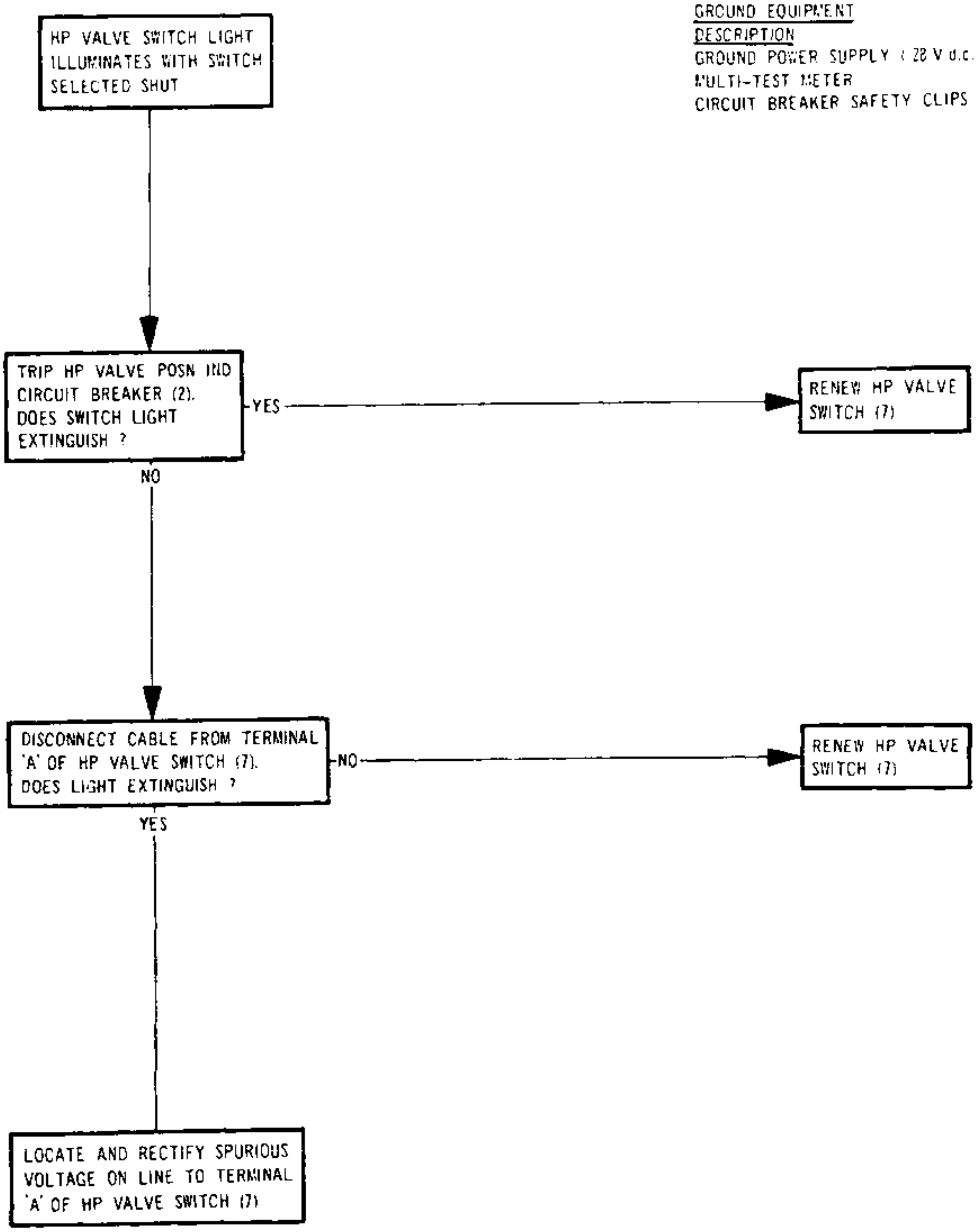


Chart 103 (Sheet 2 of 2)

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (28 V d.c.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS

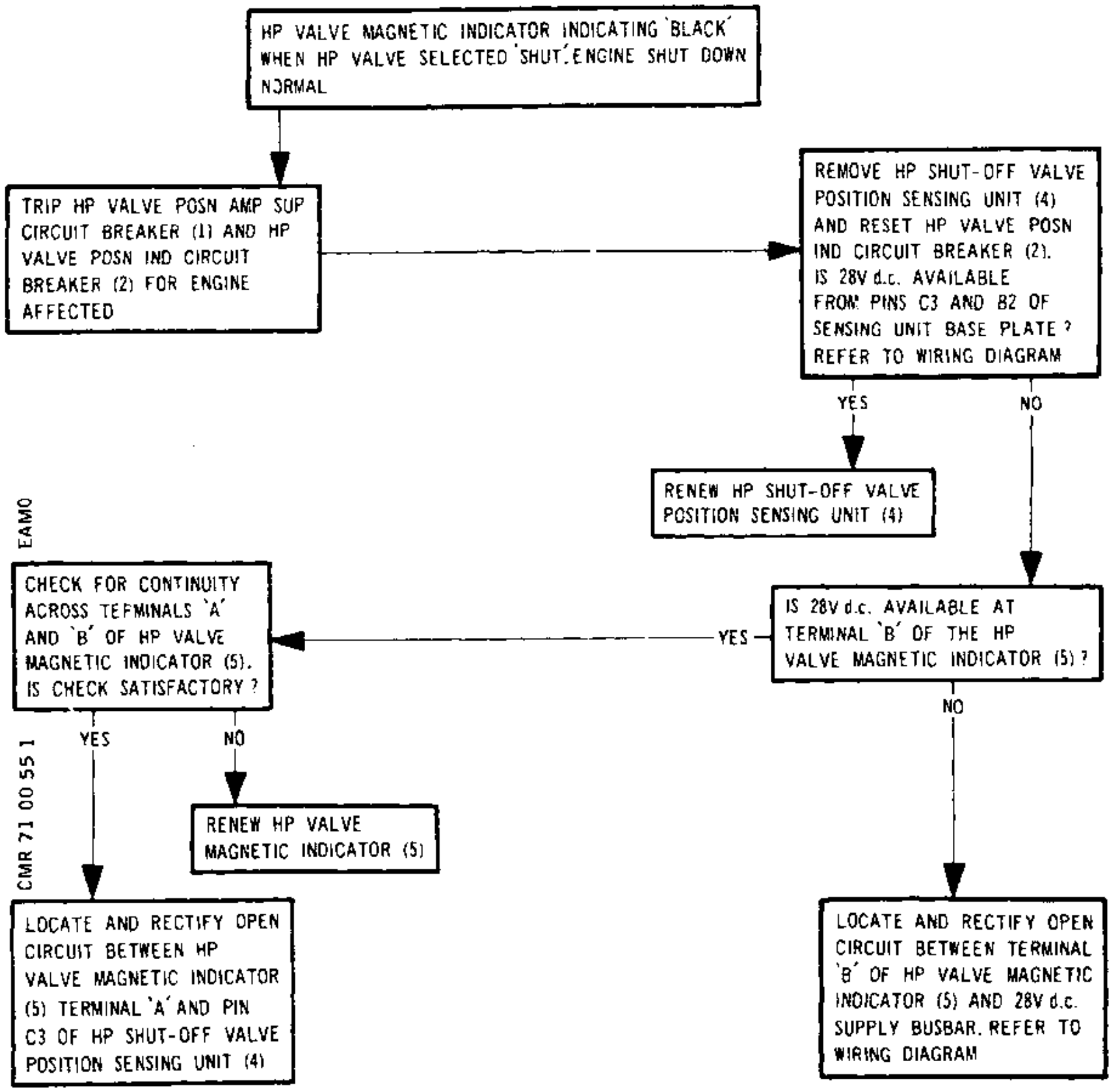


CMR 71 00 55 1 DAMO

Chart 104

NOTE : SUPPLY FAULT ON THE 28V d.c. HP VALVE POSN IND CIRCUIT BREAKER (2) TO BUSBAR WILL PRODUCE THIS INDICATED FAULT ON ENGINES 1 AND 4, OR 2 AND 3

GROUND EQUIPMENT DESCRIPTION
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS



EAMO

CMR 71 00 55 1

Chart 105

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (28V d.c.)
MULTI-TEST METER
CIRCUIT BREAKER SAFETY CLIPS

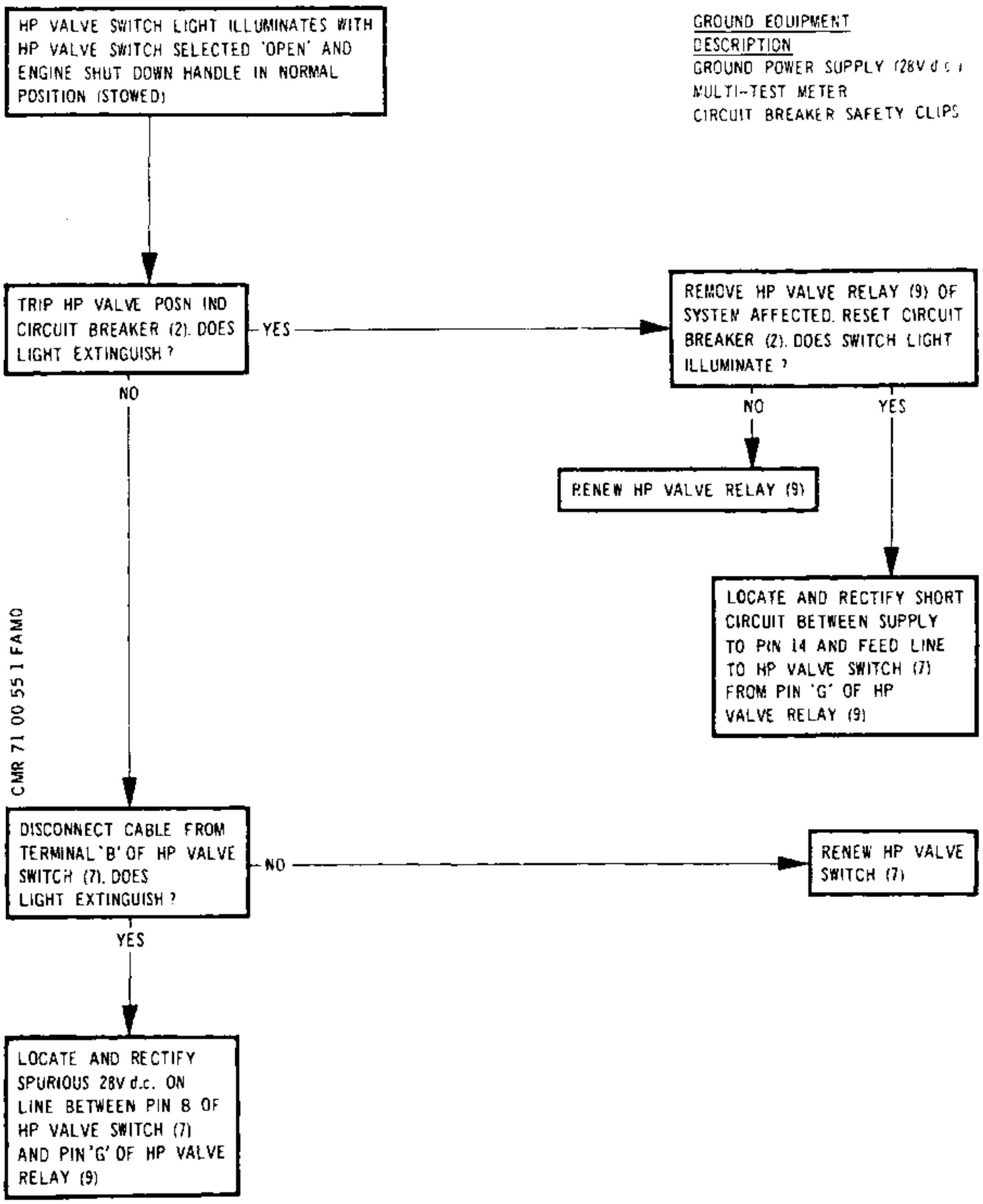
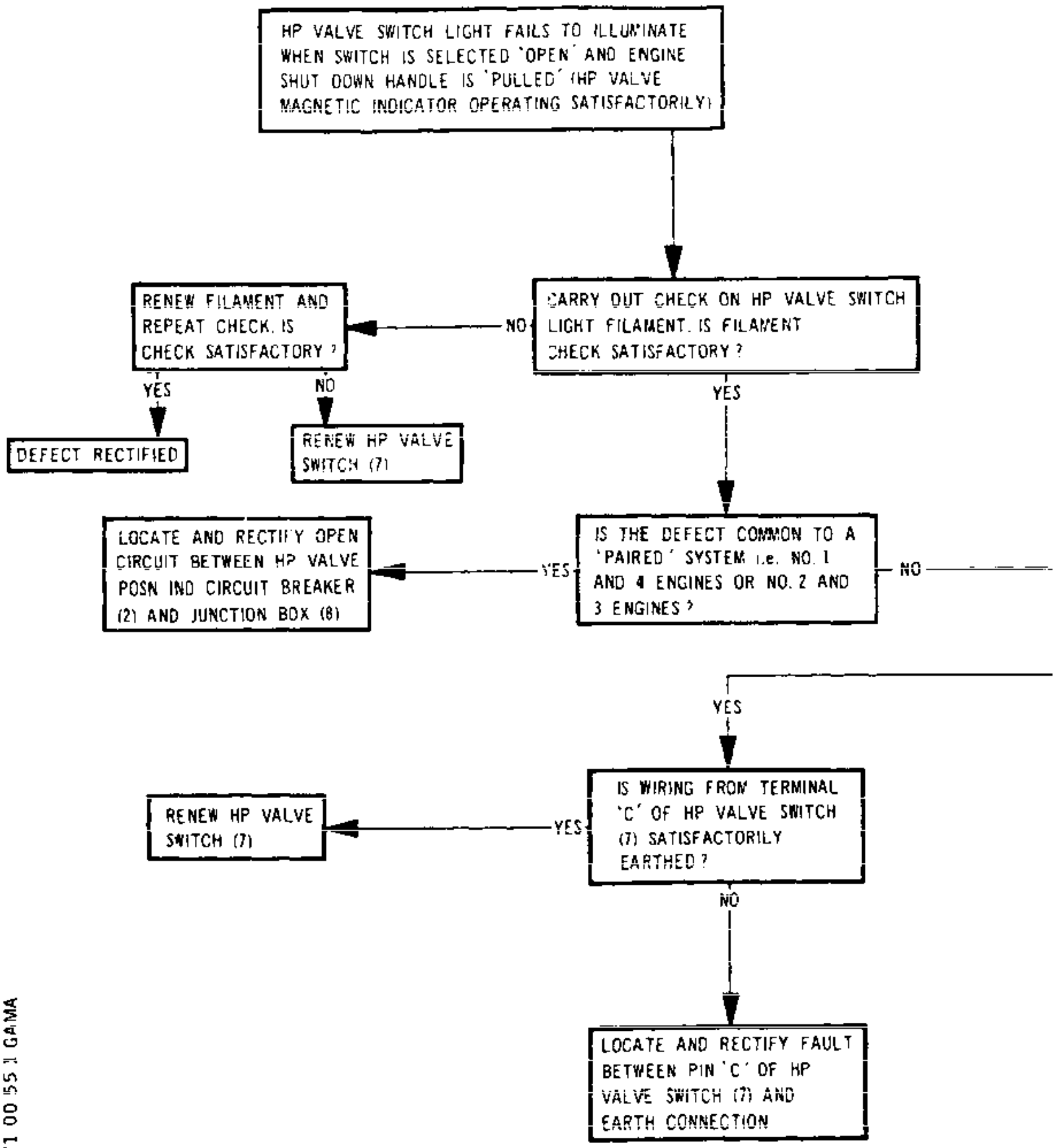


Chart 106



CMR 71 00 55 1 GAMA

Chart 107 (Sheet 1 of 2)

GROUND EQUIPMENT
DESCRIPTION
MULTI-TEST METER
GROUND POWER SUPPLY (28V d.c.)
CIRCUIT BREAKER SAFETY CLIPS

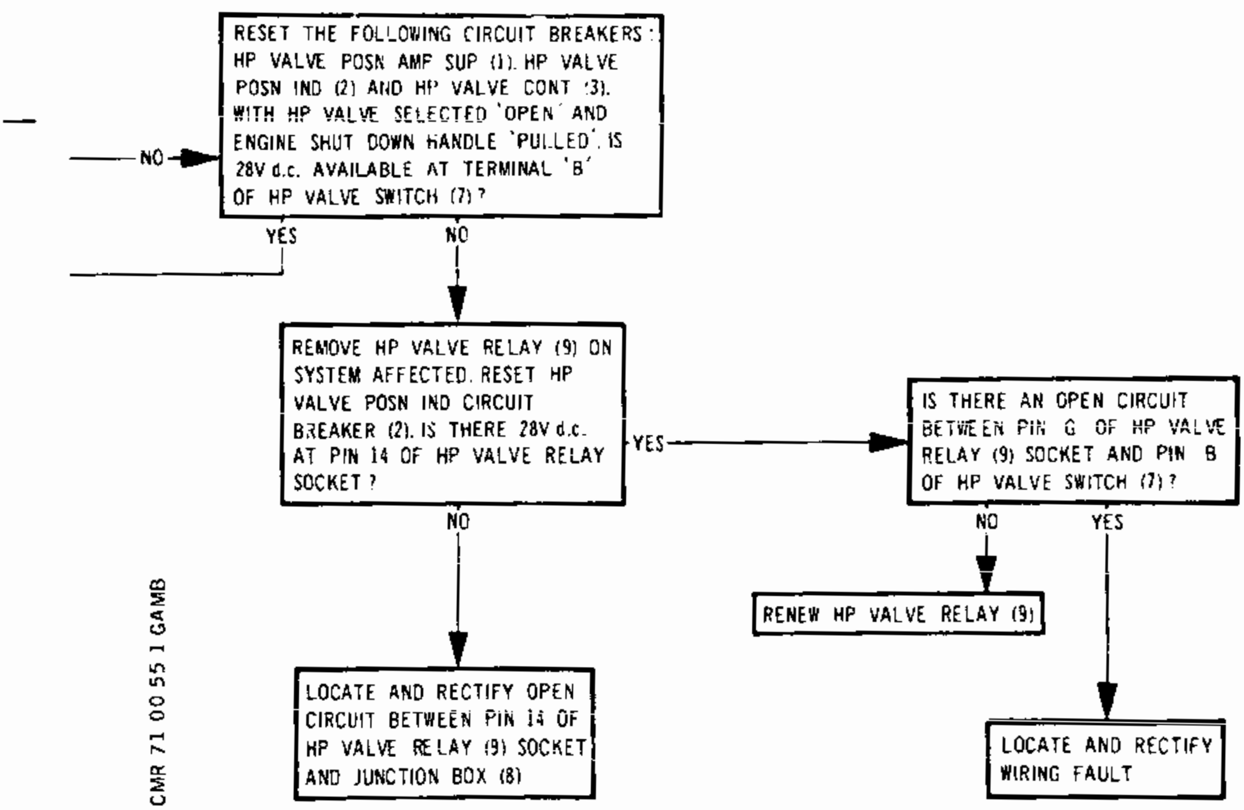
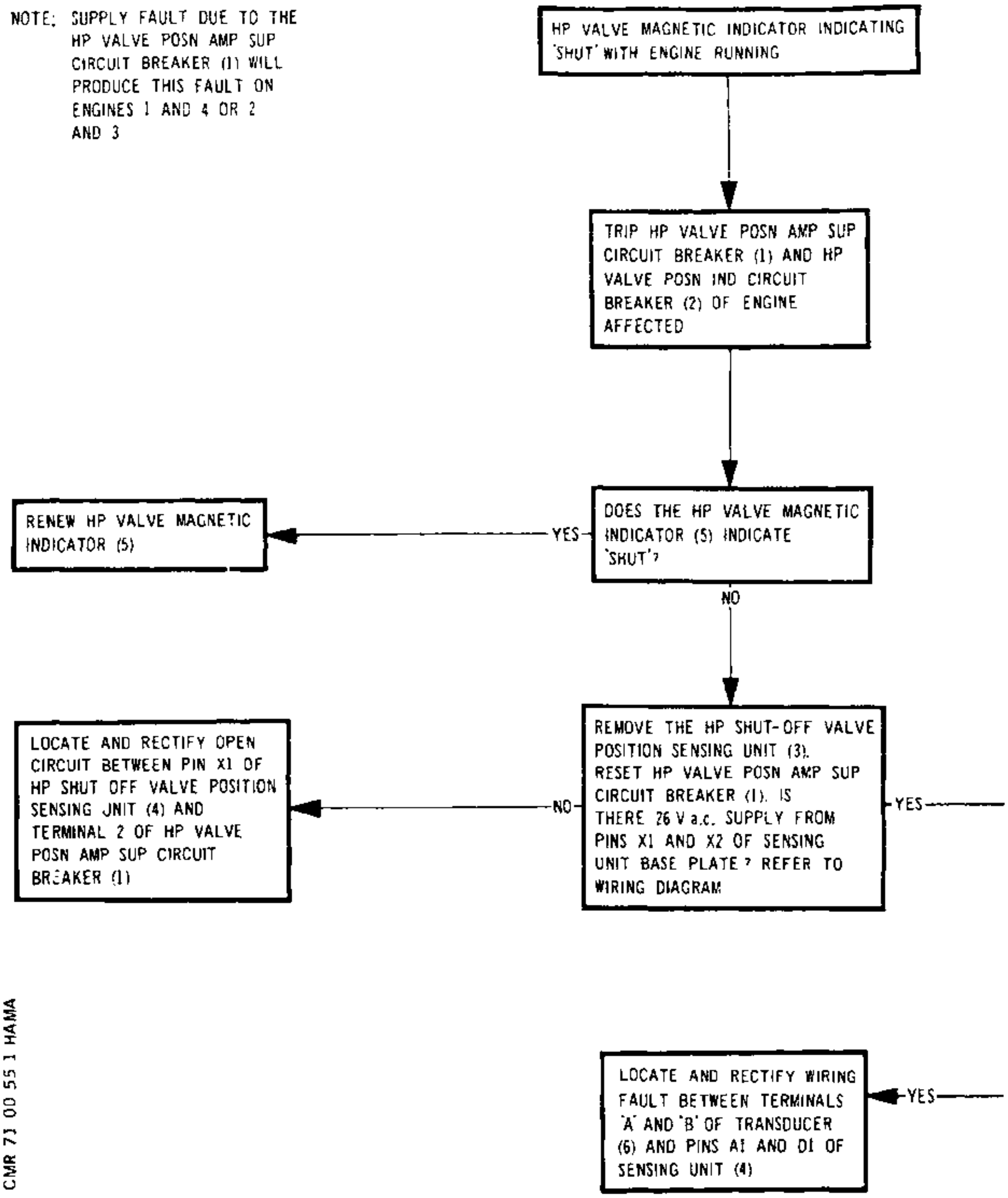


Chart 107 (Sheet 2 of 2)

NOTE: SUPPLY FAULT DUE TO THE HP VALVE POSN AMP SUP CIRCUIT BREAKER (1) WILL PRODUCE THIS FAULT ON ENGINES 1 AND 4 OR 2 AND 3



CMR 71 00 55 1 HAMA

Chart 108 (Sheet 1 of 2)

GROUND EQUIPMENT

DESCRIPTION

MULTI-TEST METER

CIRCUIT BREAKER SAFETY CLIPS

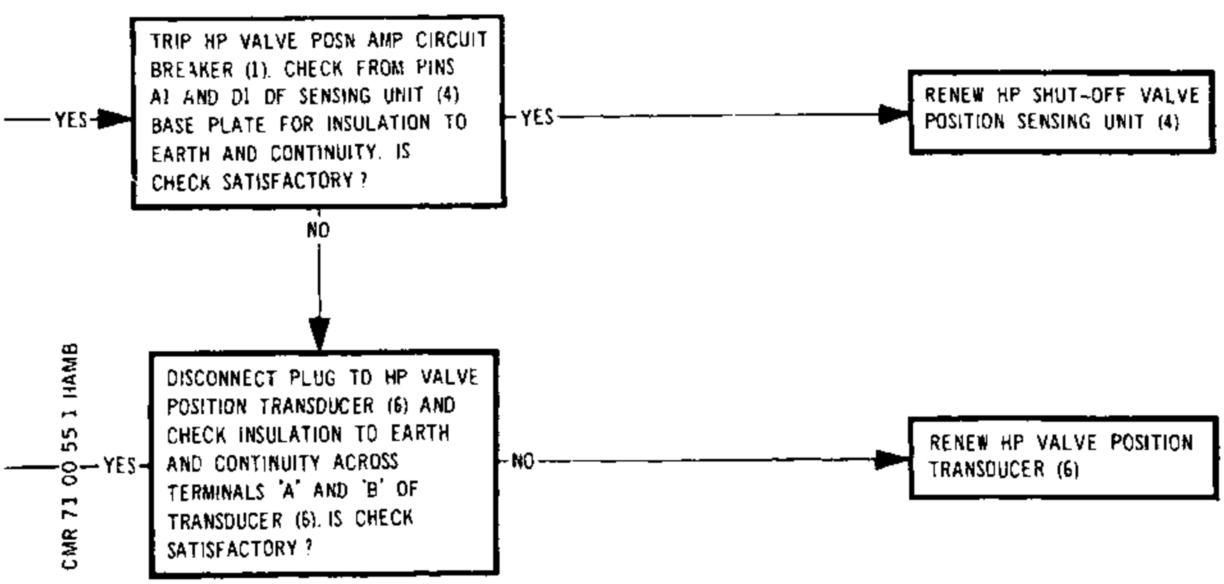


Chart 108 (Sheet 2 of 2)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
ENGINE NO. 1						
(1) Circuit breaker 26 V	-	13-216	E211	Map Ref.A6		
(2) Circuit breaker 28 V	-	15-216	E214	Map Ref. A10		
(3) Circuit breaker 28 V	-	3-213	1K131	Map Ref.C1		
(4) HP shut-off valve position sensing unit	-	19-123	1E216	-	73-34-11	
(5) HP valve magnetic indicator	-	4-211	1E215	-	73-30-00	
(6) HP valve position transducer	-	415	-	-	73-12-02	
(7) HP valve switch	-	4-211	1K132	-	73-30-00	
(8) Junction box	-	20-123	UM1874	-	73-30-00	
(9) HP valve relay	-	19-123	1K134	-	73-30-00	
(10) Terminal block UM2096	-	4-211	UM2096	-	73-30-00	
ENGINE NO. 2						
(1) Circuit breaker 26 V	-	13-215	E212	Map Ref.D14		
(2) Circuit Breaker 28 V	-	15-215	E213	Map Ref.B17		
(3) Circuit breaker 28 V	-	1-213	2K131	Map Ref.C3		

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(4) HP shut-off valve position sensing unit	-	19-123	2E216	-	73-34-11	
(5) HP valve magnetic indicator	-	4-211	2E215	-	73-30-00	
(6) HP valve position transducer	-	425	-	-	73-12-02	
(7) HP valve switch	-	4-211	2K132	-	73-30-00	
(8) Junction box	-	20-123	UM1872	-	73-30-00	
(9) HP valve relay	-	19-123	2K134	-	73-30-00	
(10) Terminal block UM2096	-	4-211	UM2096	-	73-30-00	
ENGINE NO.3						
(1) Circuit breaker 26 V	-	13-215	E212	Map Ref.D14		
(2) Circuit breaker 28 V	=	15-215	E213	Map Ref.B17		
(3) Circuit breaker 28 V	-	1-213	3K131	Map Ref. C4		
(4) HP shut-off position sensing unit	-	20-123	3E216	-	73-34-11	
(5) HP valve magnetic indicator	-	4-211	3E215	-	73-30-00	
(6) HP valve position	-	435	-	-	73-12-02	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
transducer						
(7) HP valve switch	-	4-211	3K132	-	73-30-00	
(8) Junction box	-	20-123	UM1872	-	73-30-00	
(9) HP valve relay	-	20-123	3K134	-	73-30-00	
(10) Terminal block UM2096	-	4-211	UM2096	-	73-30-00	
ENGINE NO. 4						
(1) Circuit breaker 26 V	-	13-216	E211	Map Ref. A6		
(2) Circuit breaker 28 V	-	15-216	E214	Map Ref.A10		
(3) Circuit breaker 28 V	-	3-213	4K131	Map Ref. C2		
(4) HP shut-off valve position sensing unit	-	20-123	4E216	-	73-34-11	
(5) HP valve magnetic indicator	-	4-211	4E215	-	73-30-00	
(6) HP valve position transducer	-	445	-	-	73-12-02	
(7) HP valve switch	-	4-211	4K132	-	73-30-00	
(8) Junction box	-	20-123	UM1874	-	73-30-00	
(9) HP valve relay	-	20-123	4K134	-	73-30-00	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(10) Terminal block UM2096	-	4-211	UM2096	-	73-30-00	

Component Identification
Table 101

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N1/AJ MALFUNCTION/FLUCTUATION - TROUBLE SHOOTING

1. General

If the primary nozzle fails to re-open during engine start, or requires a speed increase up to 72% N2 RPM to establish correct operation, early warning of a fault is being given. The cause must be investigated to avoid starting problems and potential running in rotating stall. This also applies if the primary nozzle closes at idle or during engine shut down.

From operational experience, a logical trouble shooting guide is seen to be necessary following the reporting of malfunctions associated with the N1 control loop, if unnecessary component rejections are to be avoided.

Instability of the N1 control loop may only be present during one particular phase of a flight or may vary between various flight phases.

It is important to know at which phase of flight the malfunction ocurs, together with the power setting and relevant parameters obtained, as a guide to logical trouble shooting. The flight crew reporting of defects of this nature therefore requires to be accurate to obviate unnecessary component rejections and associated ground checks.

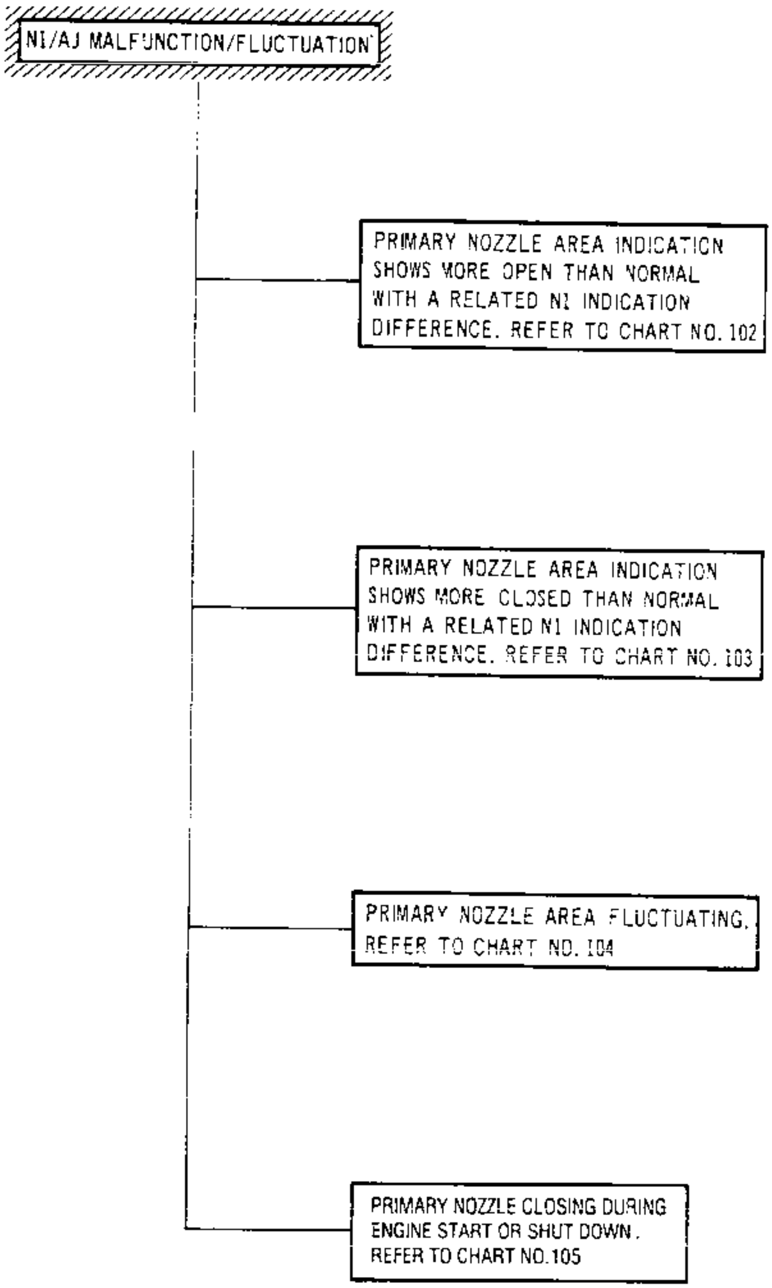
When it occurs, the worst instability is normally associated with the transonic descent phase of flight with the engines throttled back to the green band, but it can also occur during cruise, both supersonic and subsonic. It is also seen during the use of reheat. The degree of fluctuation, and its frequency if known, are helpful to trouble shooting.

The relationship of the nozzle area relative to other engines (assuming similar power settings) and the relevant N1 obtained are also important to aid trouble shooting, particularly to obviate instrument errors.

If a change of the engine control lane selection from 'MAIN' to 'ALTERNATE' or vice versa isolates the defect to one lane only, this obviates the PNC as a possible cause.

R If the malfunction results in the primary nozzle area
R indication going fully closed (below 20 per cent), fully open
R or stuck in an intermediate setting, the most probable
R causes other than an instrument error are:

R PNC-PNT Pipe system leakage
R or
R PNC



CR 35756/00B

Chart 101

CR 35757/00C

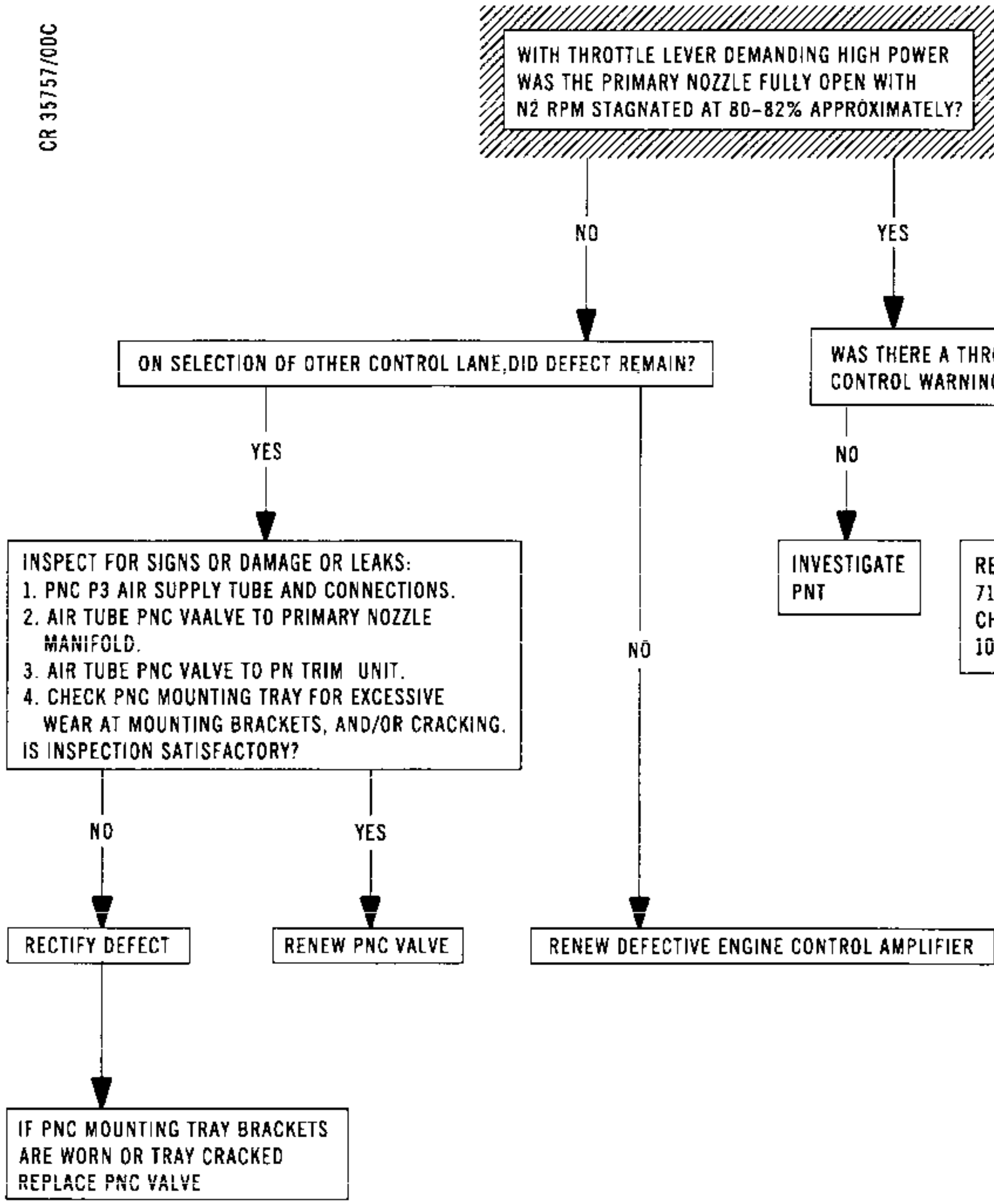


Chart 102

CR 35758/00E
BS00001835/6

R

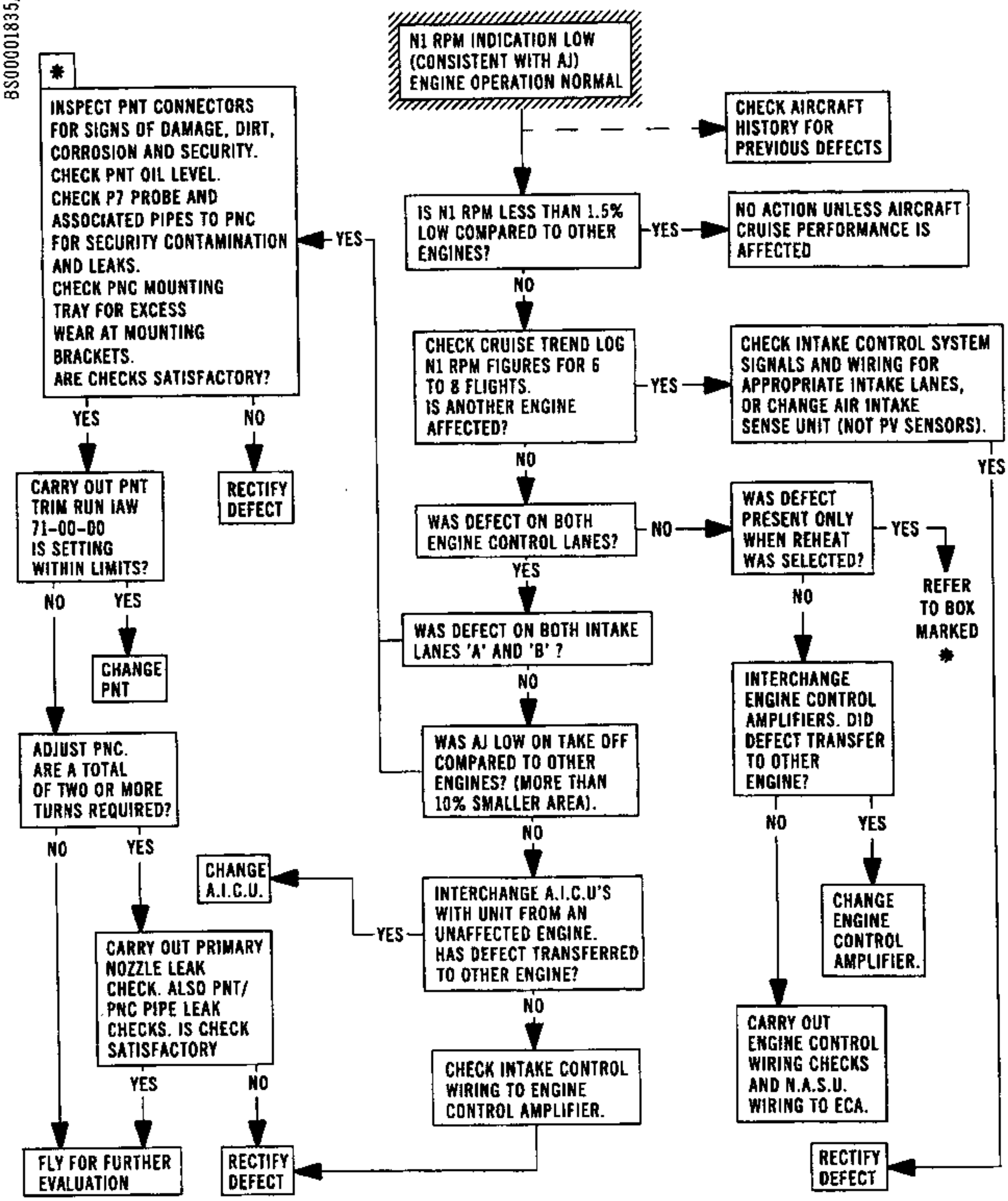
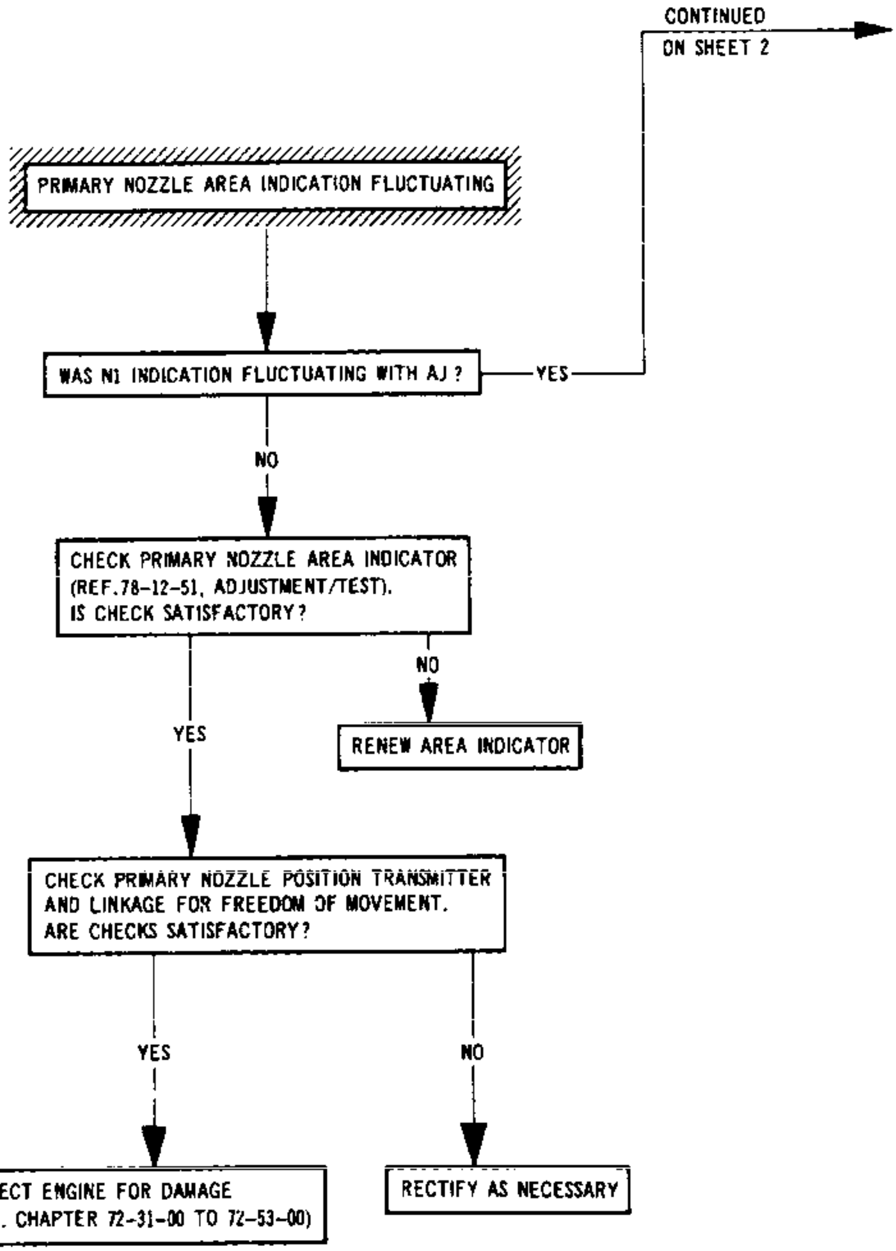


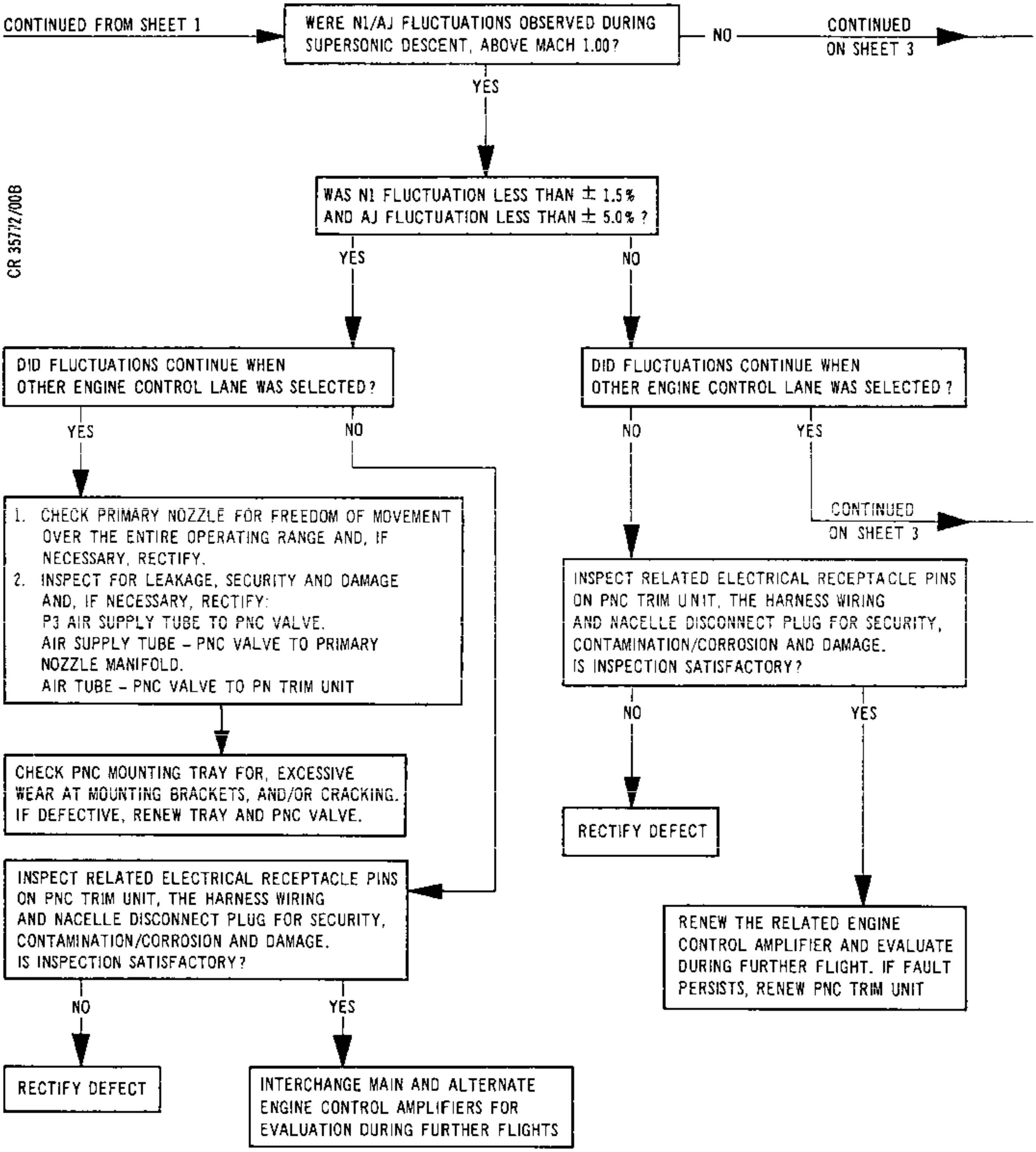
Chart 103

CR 35771/00A



CMR 71 00 56 1 DAMA

Chart 104 (Sheet 1 of 4)



R Chart 104 (Sheet 2 of 4)

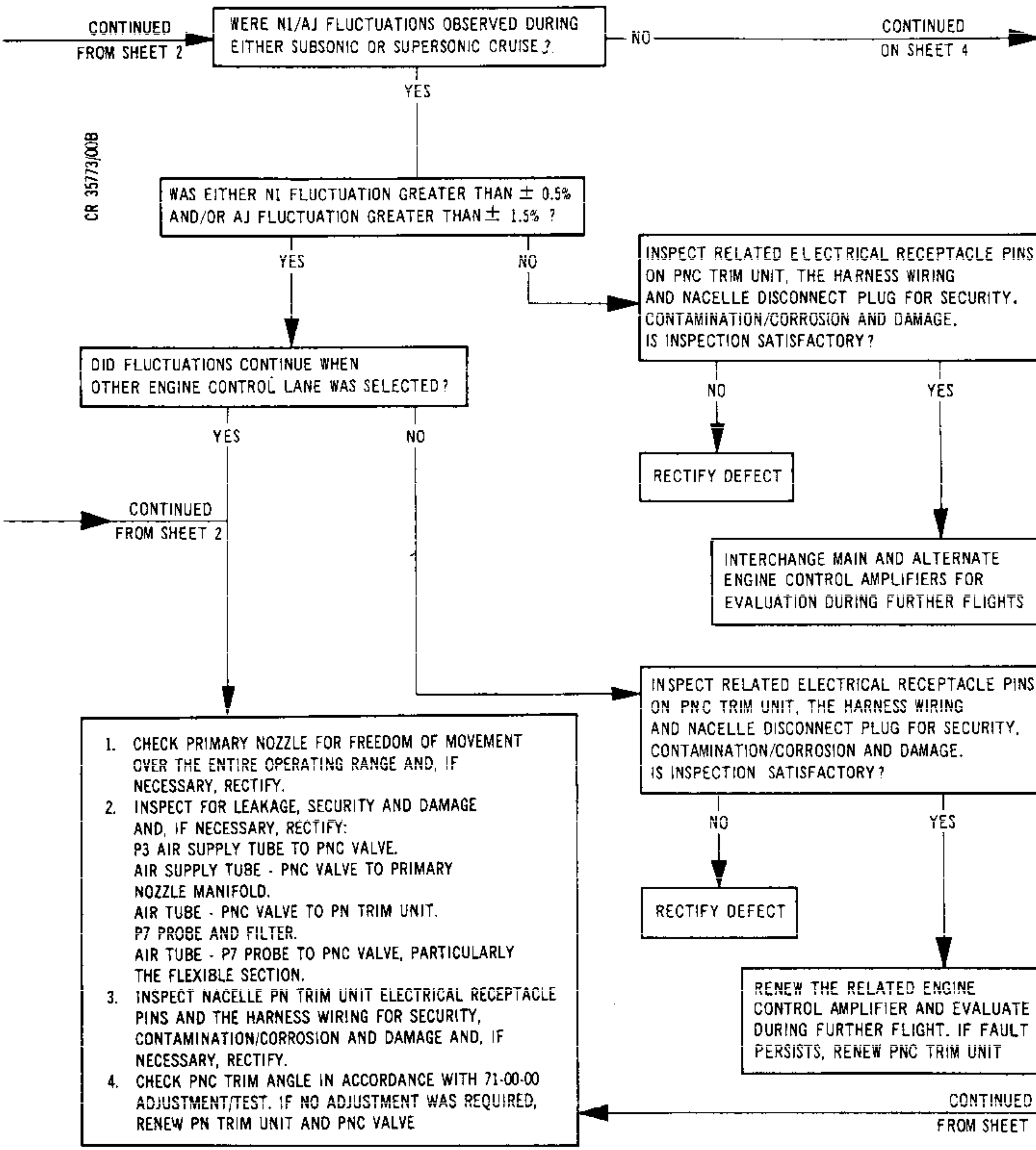


Chart 104 (Sheet 3 of 4)

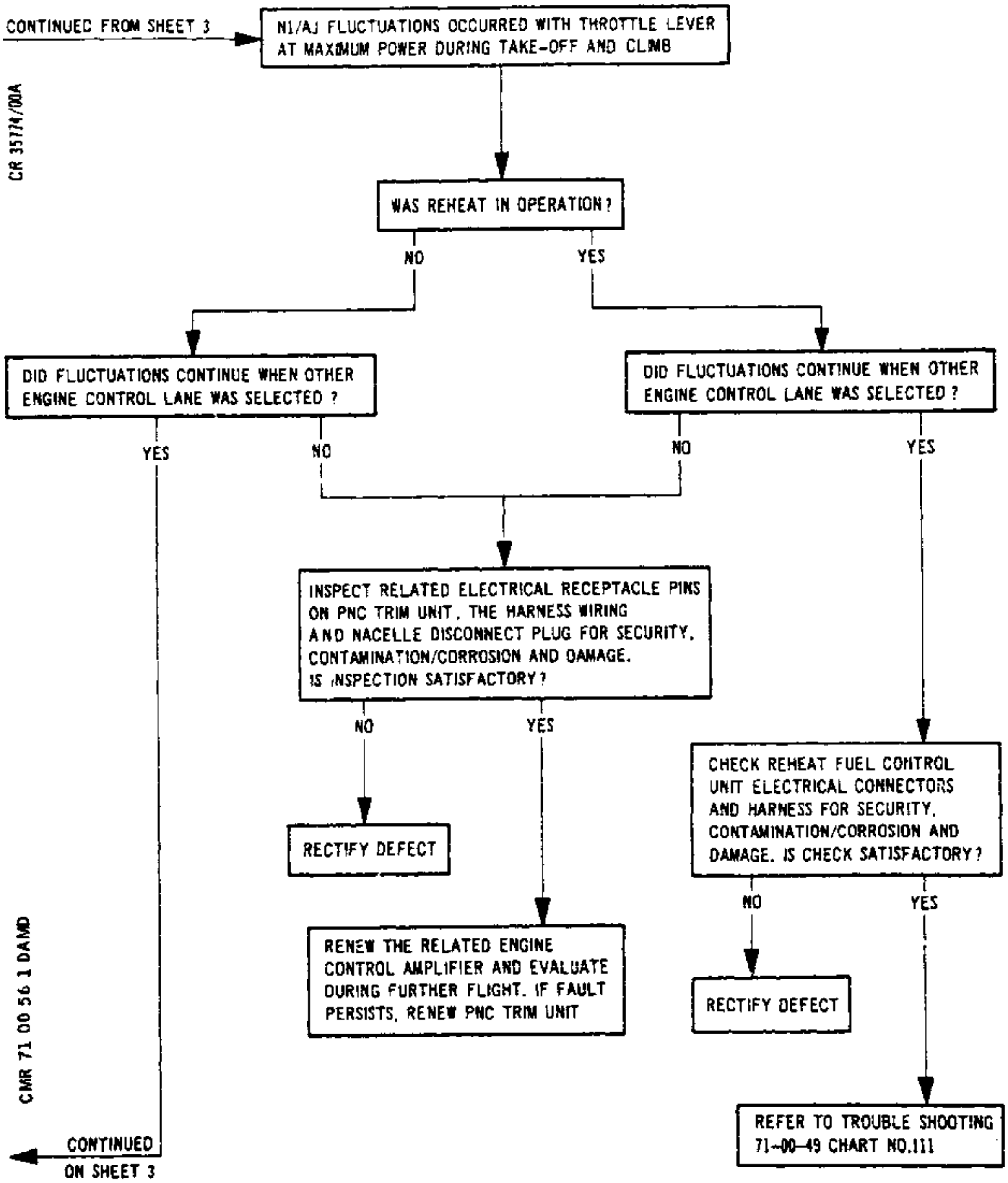


Chart 104 (Sheet 4 of 4)

Malfunctions traced to the PNC may have been caused by abnormal wear of the carbon seals assembled to the PNC piston. This wear could have been aggravated by vibration of the PNC mounting tray. Checks should be made to ensure that there is no unacceptable wear at the tray mounting brackets or cracking of the mounting tray.

The following charts show a logical sequence of trouble shooting from symptoms reported in service.

2. Preparation

WARNING: COMPLY WITH ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00

A. Ensure that external electrical power supply is connected and switched on.

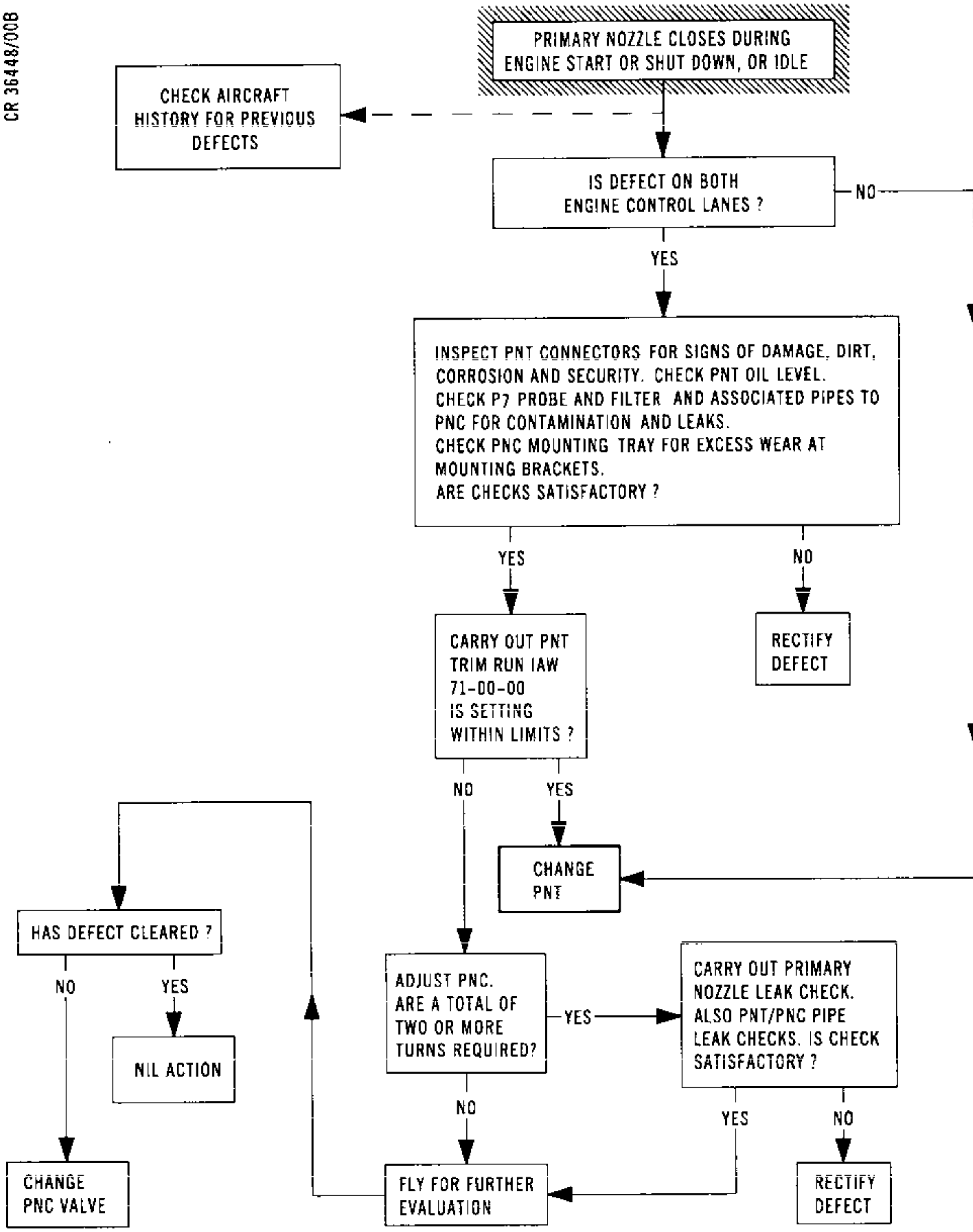
B. Consult Chart 101 and carry out the actions indicated to determine which of the trouble shooting charts is applicable.

3. Restore to Flight Standard

A. Complete and check any necessary rectification.

B. Reconnect all points where disconnection has been made during checking and rectification procedures.

CR 36448/00B



R
R
R

Chart 105

ENGINE RUN-DOWN FROM A SELECTED POWER SETTING - TROUBLE SHOOTING

1. General

If an engine run-down (deceleration) occurs from the engine power condition selected by the pilots throttle lever and the engine rating and schedule selector settings, then any activated warnings or indications should be recorded and used to facilitate trouble shooting and obviate unnecessary ground runs. It should also be noted whether the run-down occurs on only one lane or on both.

When an engine run-down is associated with only one engine control lane, MAIN or ALTERN, ascertain if the incident occurred during reheat operation, from sub-idle conditions or a deceleration phase. A run-down that occurs on both a MAIN and an ALTERN lane selection directs the trouble shooting to components such as the engine fuel flow control unit or primary nozzle control units.

2. Preparation

WARNING: COMPLY WITH ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

A. Connect external electrical power supply as required for checks.

B. Consult Table 101 and determine from the engine run-down symptoms ascertained and recorded the applicable trouble shooting chart.

	DEFECT	CHART NO.
R	Engine rundown from idle	101
R	Loss of power on take-off	102
R	Engine run-down on both main and alternate engine control lanes	103
R	Engine control amplifier checks	104

List of Trouble Shooting Charts
Table 101 (continued)

DEFECT	CHART NO.
R Run-down on one engine control lane	105
R Rapid deceleration from selected RPM R (possible flame out)	106

List of Trouble Shooting Charts
Table 101

3. Restore to Flight Standard

   A. Complete and check any necessary rectification.

   B. Reconnect all points where disconnection has been made during checking and rectification procedures.

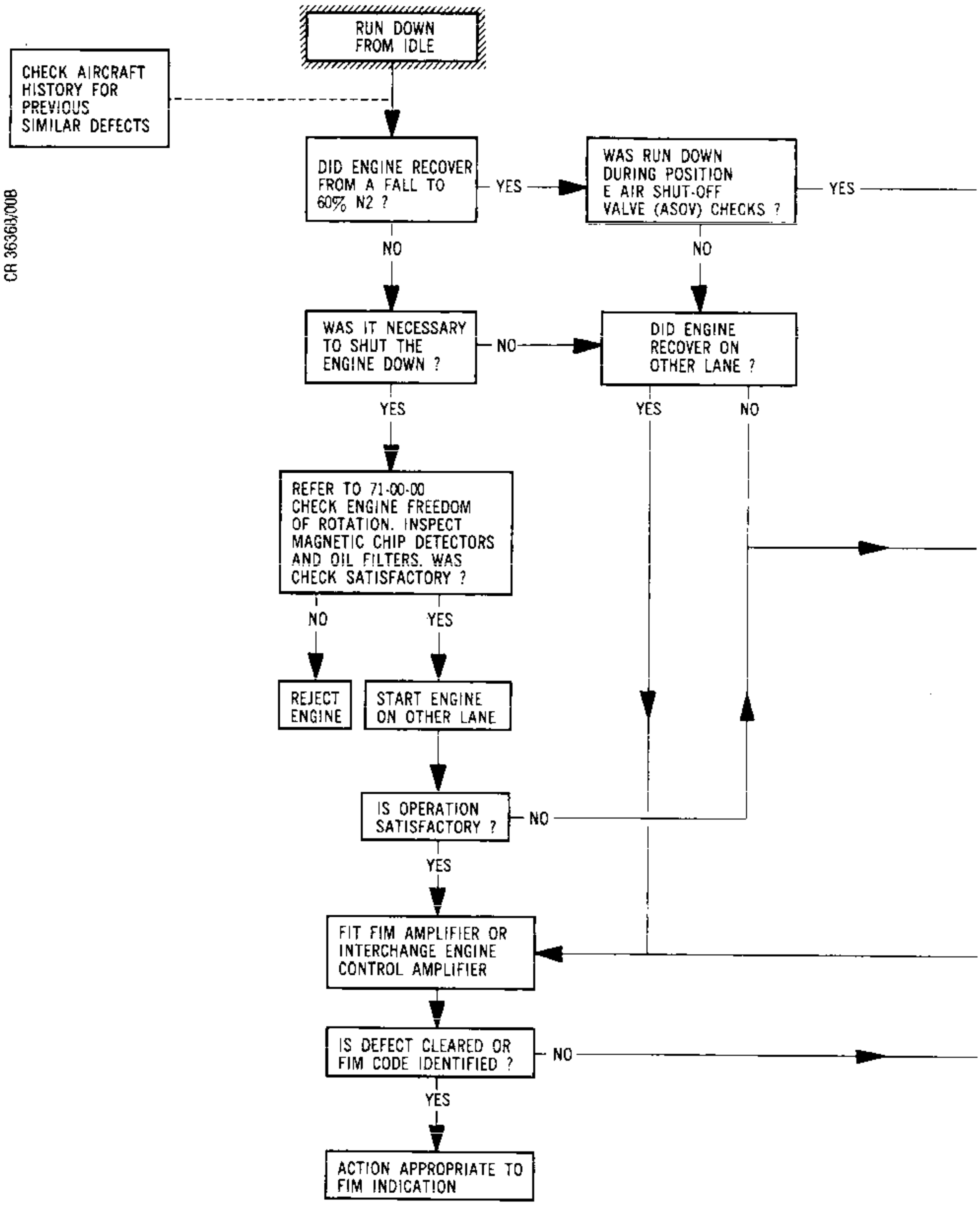


Chart 101 (Sheet 1 of 2)

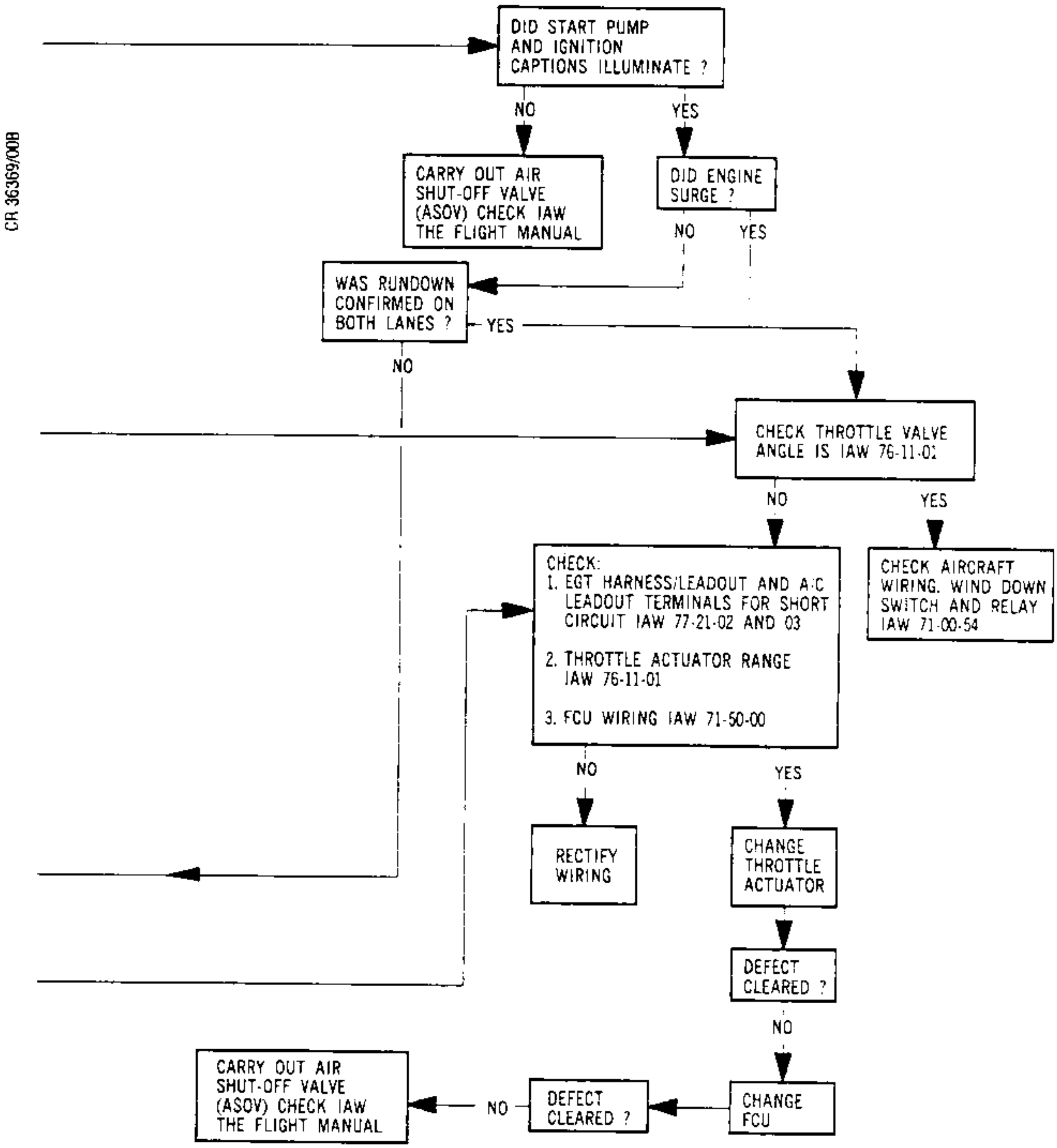


Chart 101 (Sheet 2 of 2)

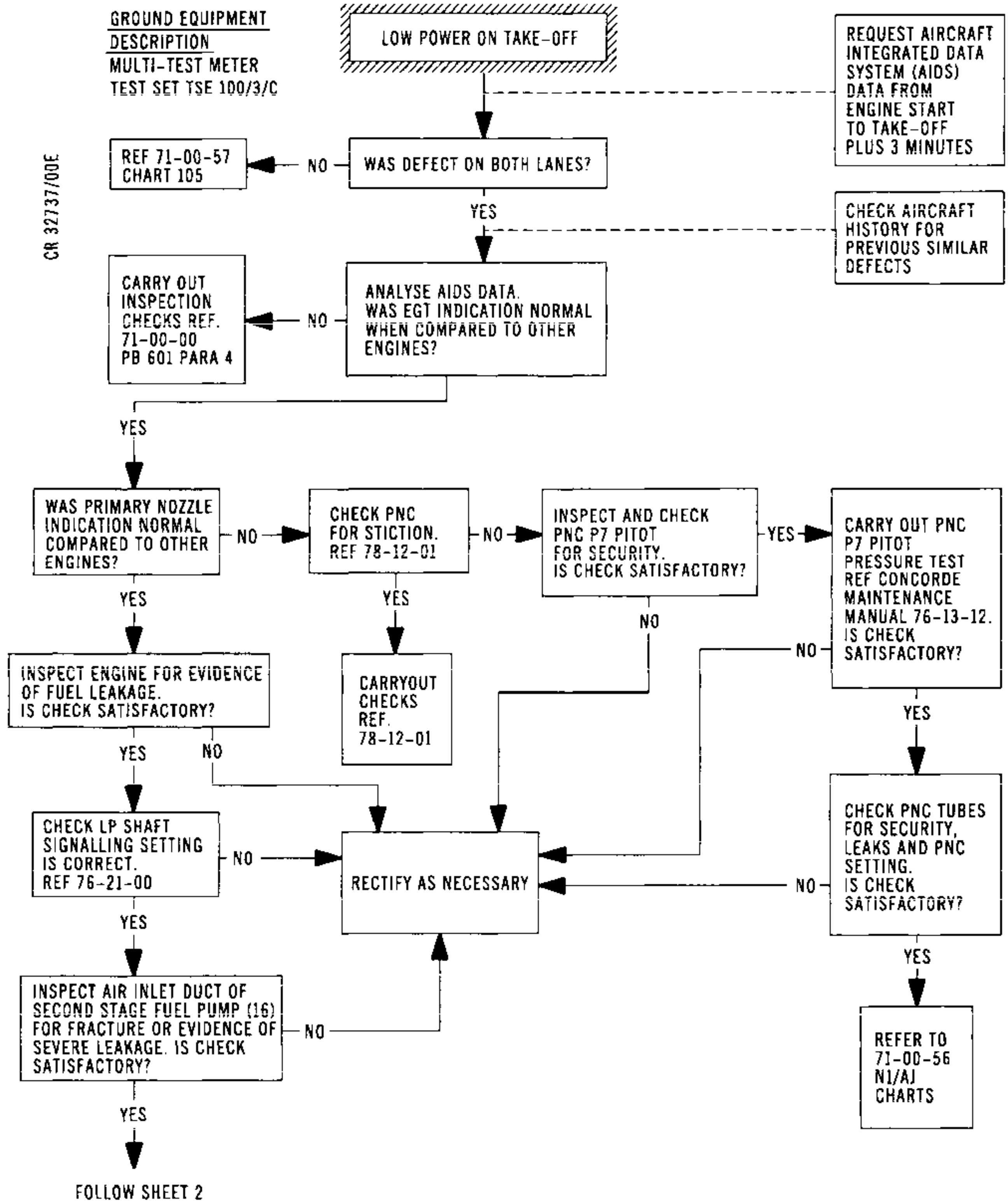


Chart 102 (Sheet 1 of 2)

CR 32738/000

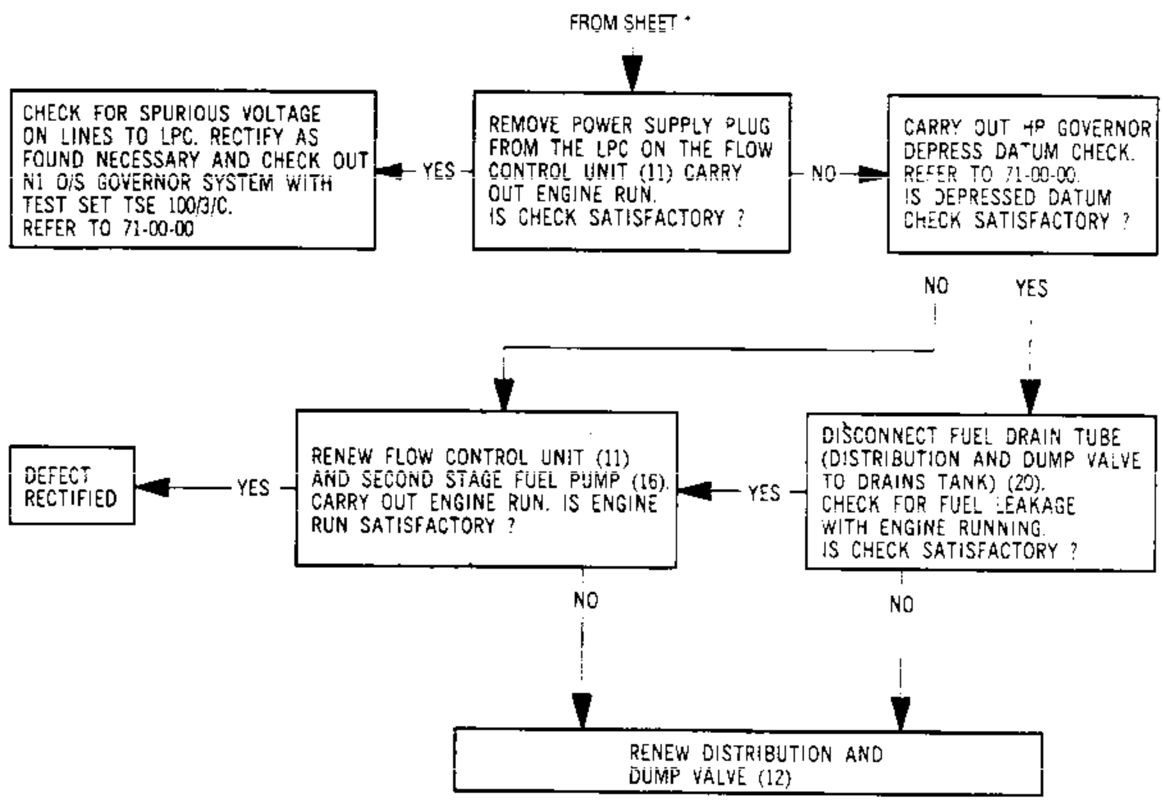


Chart 102 (Sheet 2 of 2)

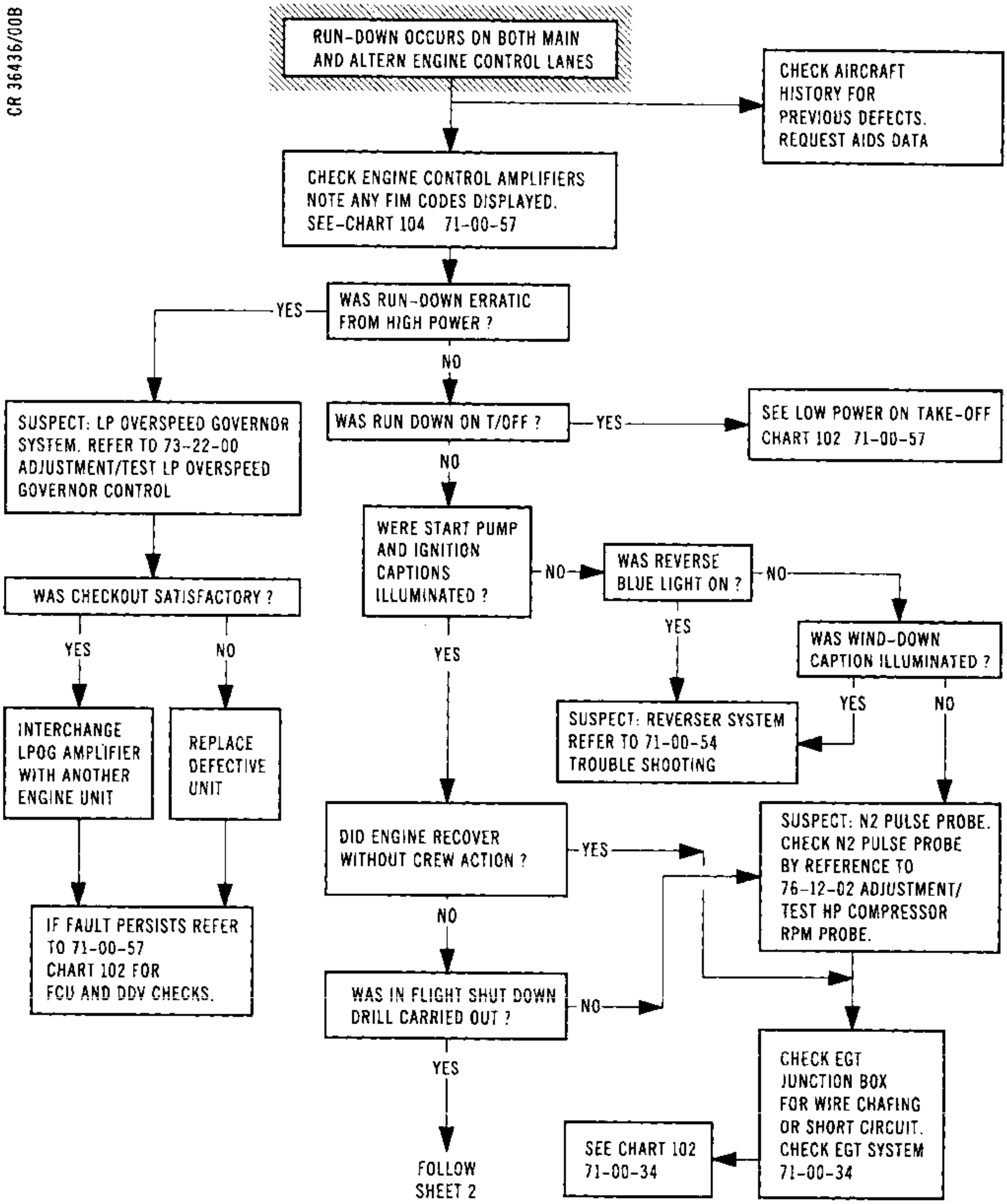


Chart 103 (Sheet 1 of 2)

CR 36437/00B

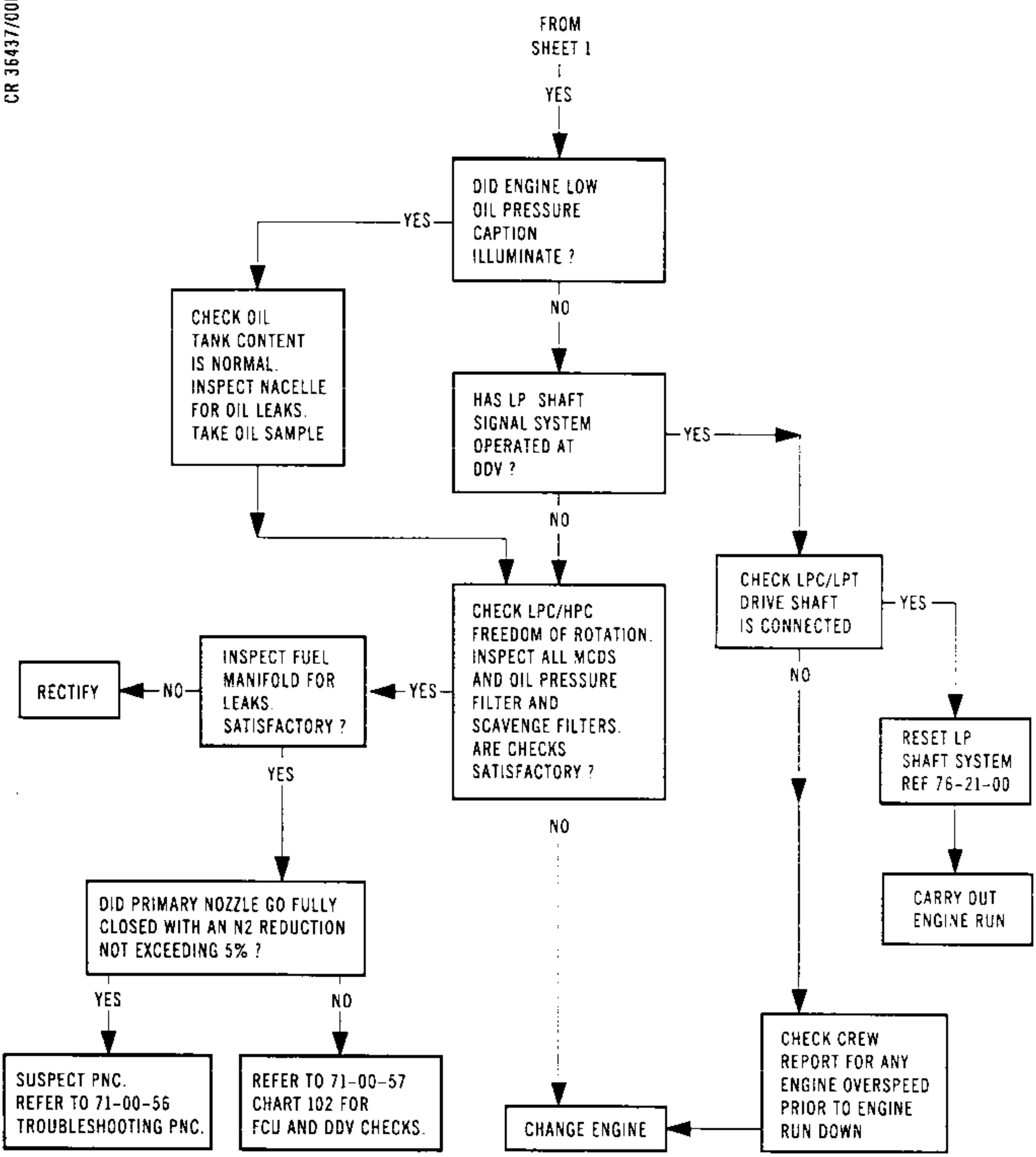


Chart 103 (Sheet 2 of 2)

CR 36438/00A

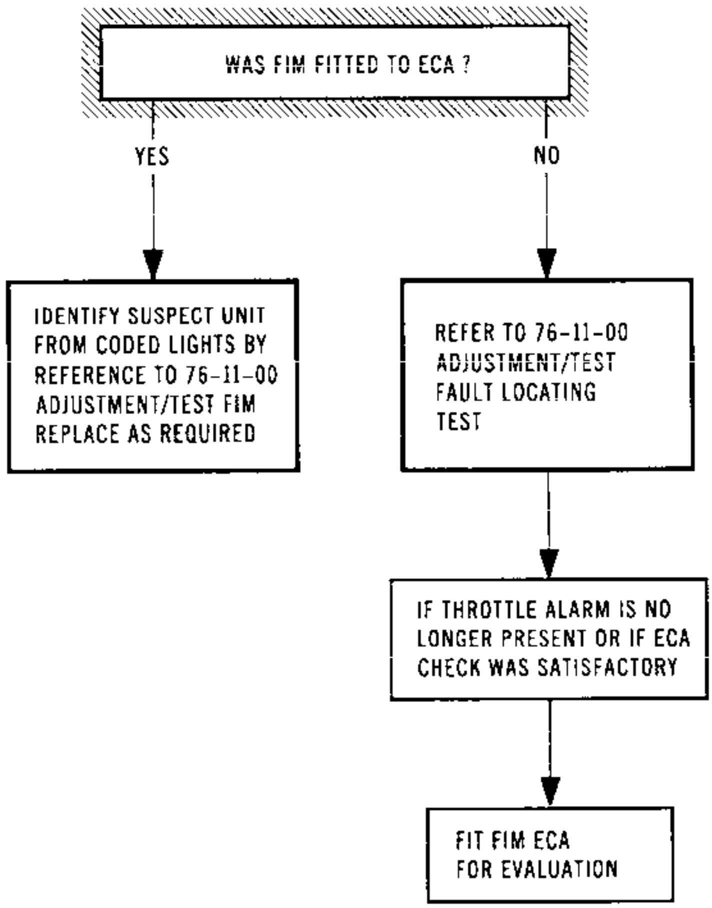


Chart 104

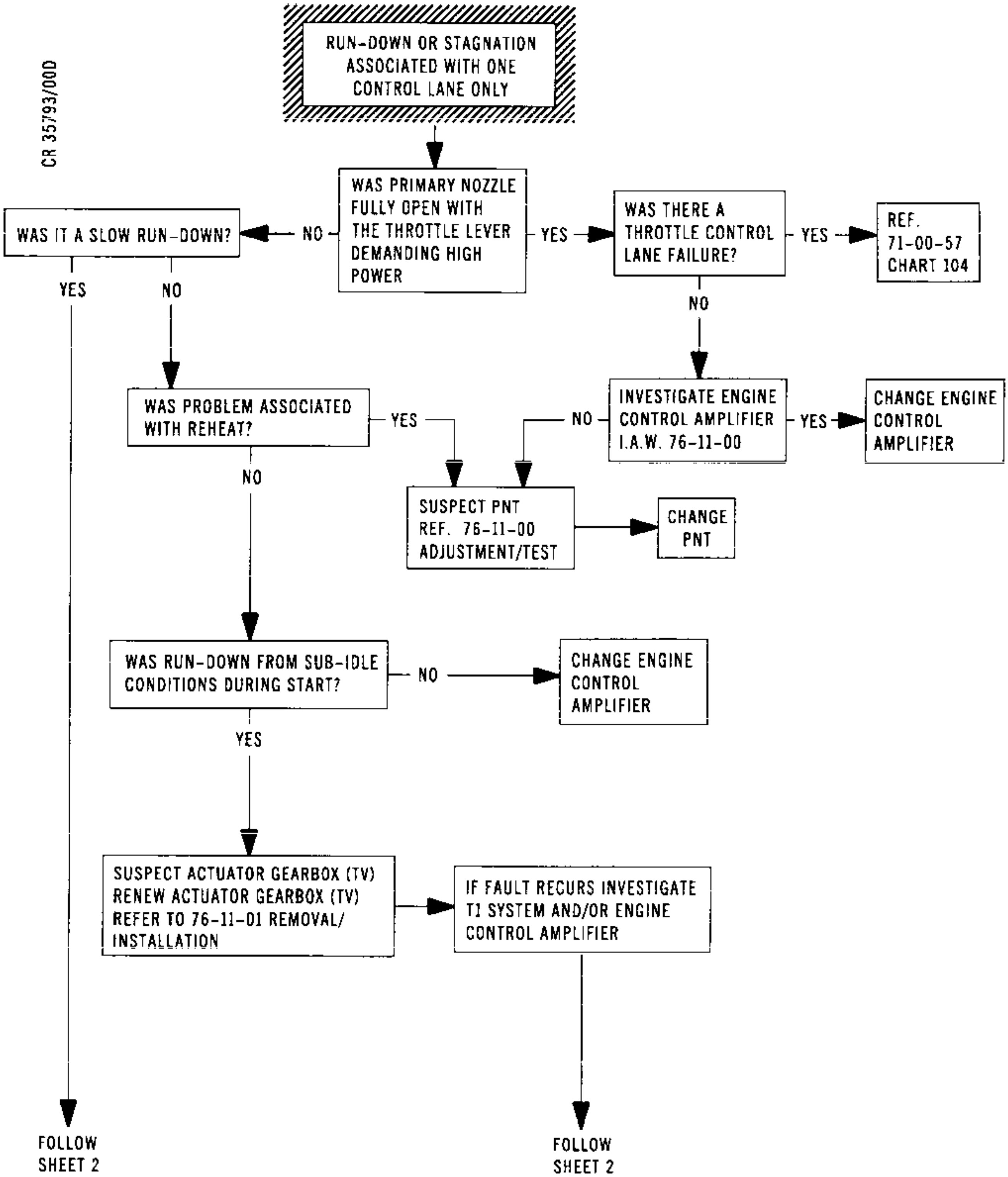


Chart 105 (Sheet 1 of 2)

CR 36597/00A

FROM SHEET 1

FROM SHEET 1

SUSPECT: T1 SYSTEM OR ECA. CHECK THE T1 SYSTEM BY COMPARING THE FAULTY LANE WITH IT'S ASSOCIATE USING 76-11-00 ADJUSTMENT/ TEST PARA 3, SELECT POSITIONS 16 AND 17 IN TURN, OBSERVE METER INDICATION READS 50±5 FOR A SATISFACTORY TEST.

NOTE:- POSITION 17 READING WILL BE MARGINALLY HIGHER.

TRANSFER THE TEST SET TO THE OTHER CONTROL AMPLIFIER, REPEAT TEST AT POSITIONS 16 AND 17 FOR COMPARISON CHECK.
WAS TEST SATISFACTORY?

YES

HAS SIMILAR RUN-DOWN OCCURRED DURING PREVIOUS FLIGHTS ON THE SAME LANE?

YES

SUSPECT: INTERMITTENT FAULTS IN THE T1 SYSTEM. INVESTIGATE ENTIRE T1 SYSTEM, NOTING CSNL 070-76

NO

CHANGE ENGINE CONTROL AMPLIFIER

NO

INVESTIGATE T1 PROBE AND CONNECTOR. REFER TO 76-11-14 PAGE 601 NOTING CSNL 070-76

Chart 105 (Sheet 2 of 2)

CR 36555/00B

R

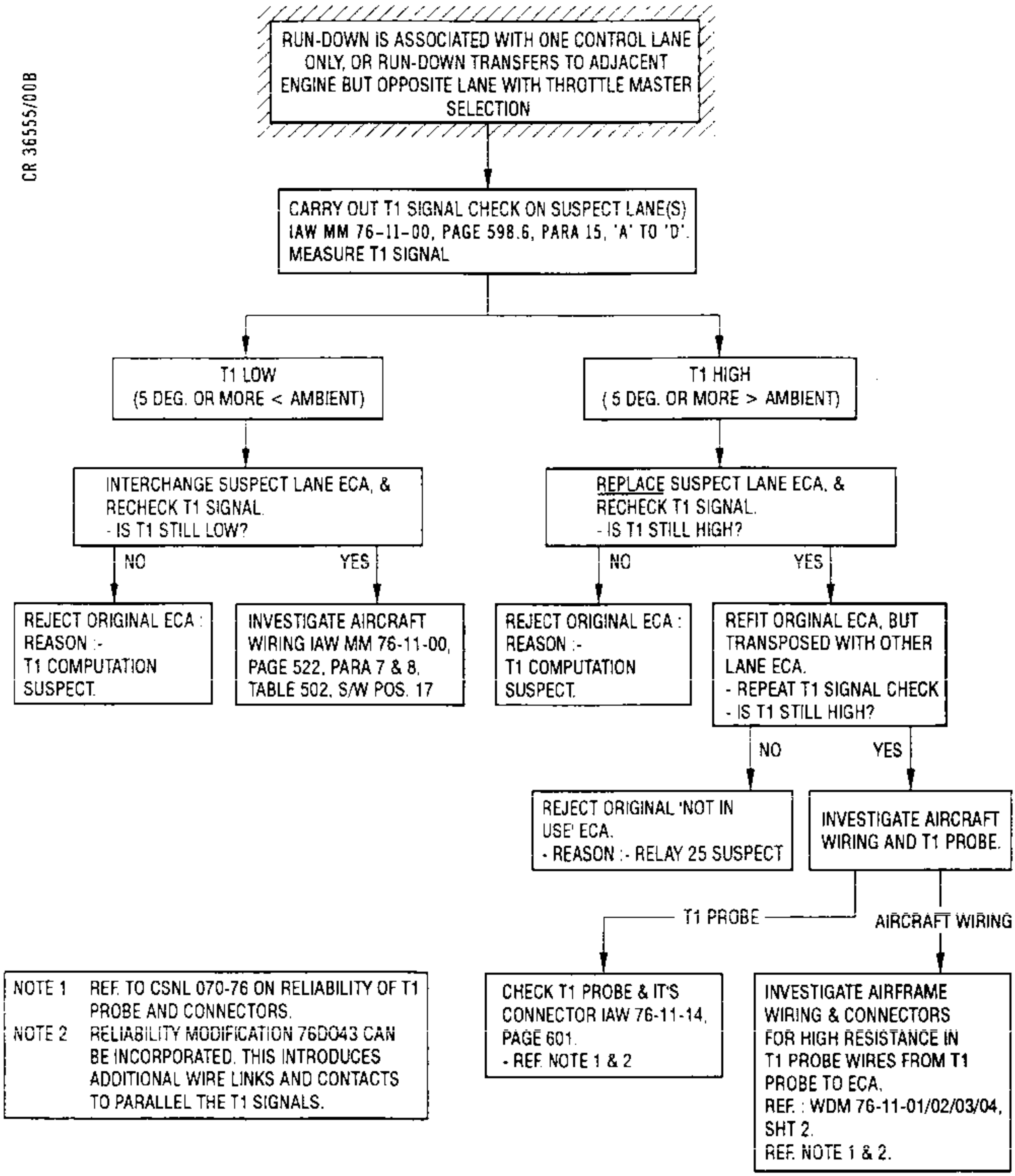


Chart 105A

CR 32739/00A

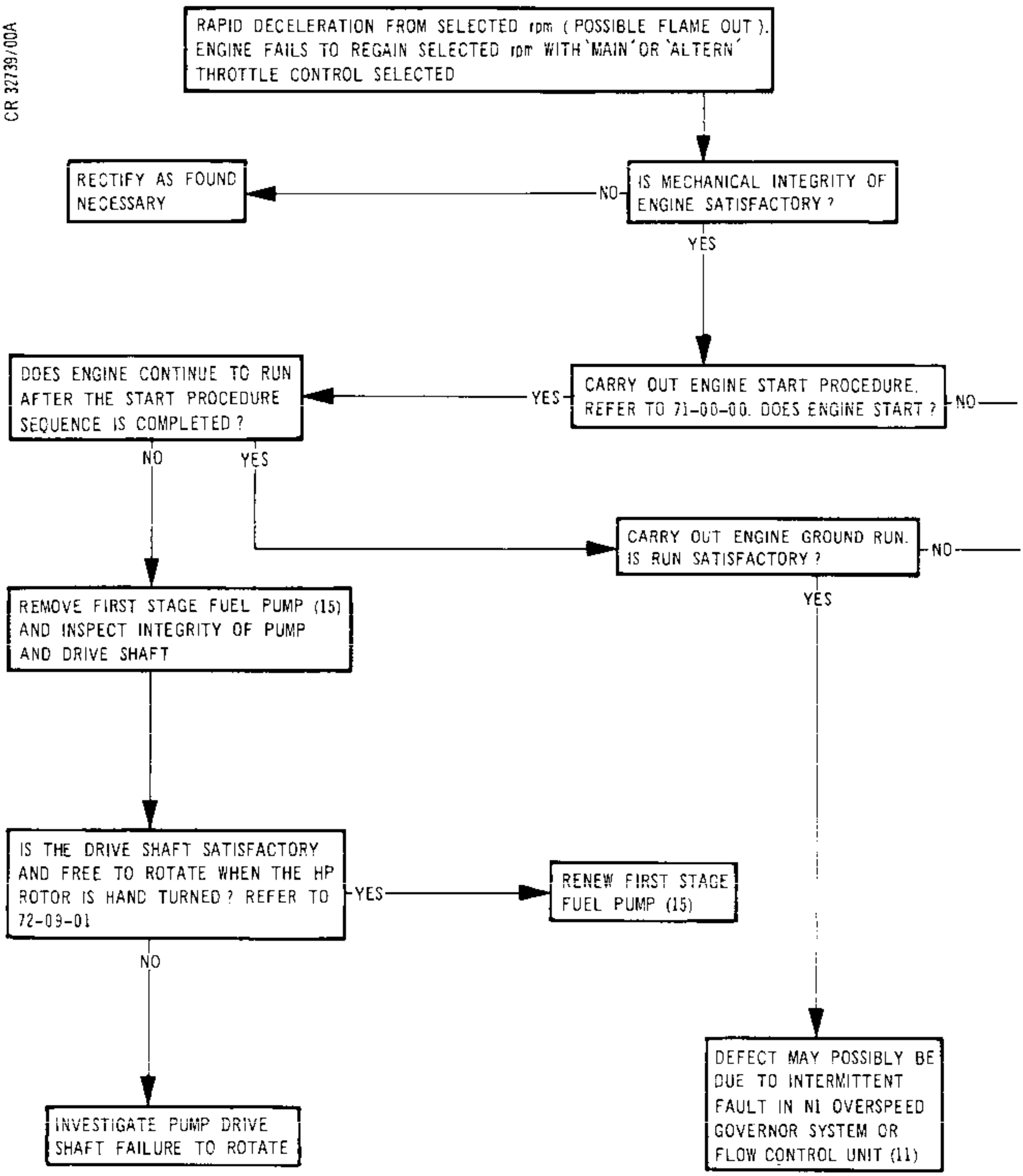


Chart 106 (Sheet 1 of 2)

CR 32740/00A

GROUND EQUIPMENT
DESCRIPTION
GROUND POWER SUPPLY (208 V a.c.,
115 V a.c. AND 28 V d.c.)
AIR SUPPLY FOR STARTING
MULTI-TEST METER
TEST SET TSE 100/3/C

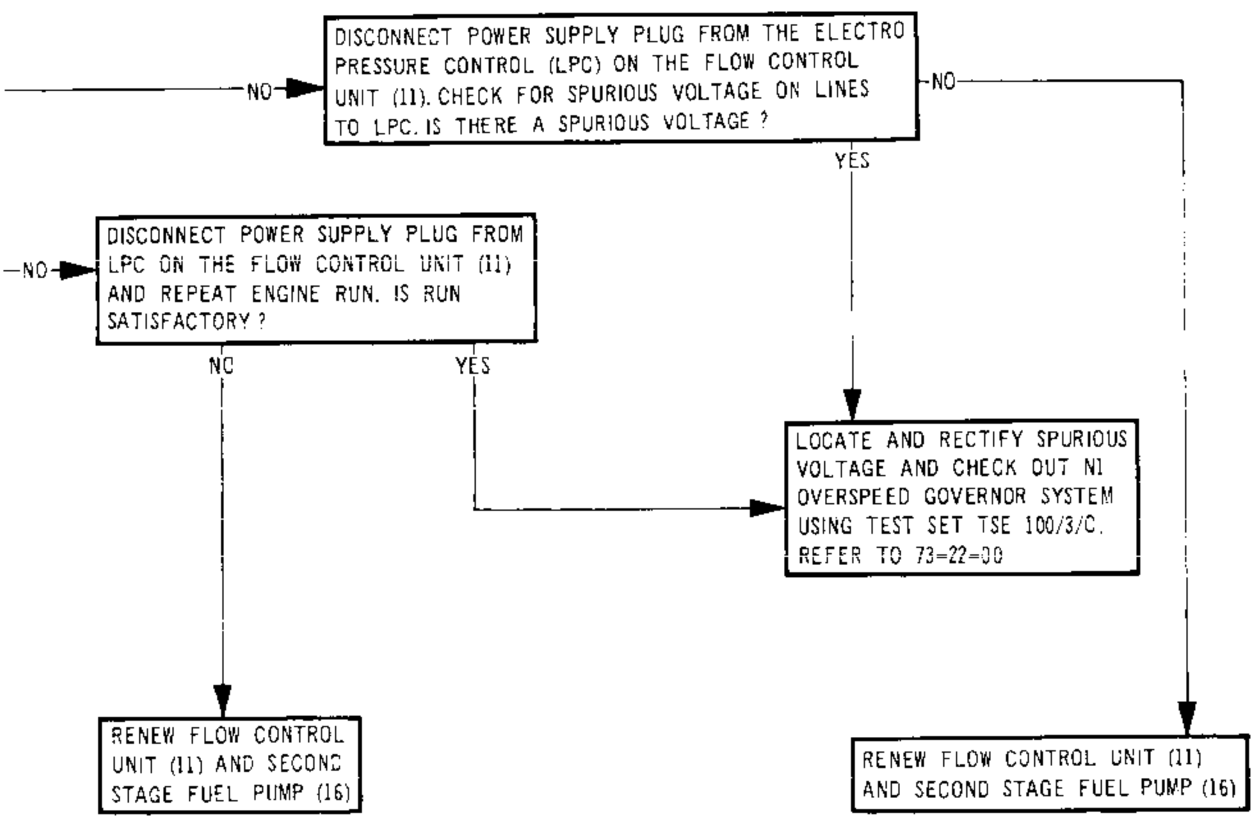


Chart 106 (Sheet 2 of 2)

HIGH OIL CONSUMPTION - TROUBLE SHOOTING

1. General

Use of the monitoring procedure given in 12-13-79, Replenishing Oil Tank, will establish when the oil consumption rate or the rate of increase in consumption have reached unacceptable levels.

The oil tank contents indicator will not indicate less than 4 U.S. quarts. Should a further two quarts be consumed, the oil supply to the pump will be affected and the low oil pressure warnings be activated although 4 U.S. quarts will still be indicated.

When a shut-down in flight and windmilling has occurred, the action to be taken is detailed in 71-00-00, Inspection/ Check. When the shut-down is associated with high oil consumption i.e., low oil tank contents, this trouble shooting procedure should be phased in with the Inspection After Shut-down (Windmilling) in flight procedure to avoid duplication of checks.

Should signs of an external leak be seen after an engine run but the source of the leak be uncertain, clean the suspect region with a proprietary cleaning agent and then use a standard engineering practice such as an application of french chalk to the suspect region and further engine run.

R External engine oil leakage can result in contamination
R of engine or nacelle mounted electrical connectors, this
R can result in system malfunction. If contamination is
R suspected the affected connector must be cleaned, for
R procedure see 70-00-11 Standard Practices.

Checks at the engine vents should be made using slave tubes with bores not less in internal diameter than the vent tube and with fully vented containers. Slave tubes with a smaller internal diameter will cause back pressure and excessive venting, or, in respect of the oil tank vent, damage to the oil tank. For the oil tank vent the container capacity should be 25 litres and the containers for the remaining vents be 1 litre each. Disconnect seal drains system tubes as required to trace source of a leakage from collective outlets (Ref. Oil Drains 71-79-00, 71-79-01 and 71-79-02 and 71-00-24, Engine Drains, Trouble Shooting).

The trouble shooting procedures given in 71-00-43, Oil Contents and 71-00-44, Oil Pressure should be considered in conjunction with the procedures given in this chapter/ topic.

B Oil loss may also result from distress within the fuel
B cooled oil cooler. Therefore, whenever checks fail to
B reveal external leaks or excessive venting, it is
B recommended that a fuel contamination check of the oil
B system is carried out as per 79-00-02.

2. Preparation

WARNING: COMPLY WITH ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

A. Connect external electrical power supply as required for checks.

B. Consult Table 101 and determine from the symptoms ascertained the applicable Trouble Shooting Chart.

SYMPTOM	CHART NO.
Oil leakage from oil tank vent overboard spill	101
Excessive oil discharge from the cold or hot vents	102
Oil exudes from drains tank when press to test valve is operated	103
Miscellaneous external oil leaks	104

List of Trouble Shooting Charts
Table 101

3. Restore to Flight Standard

A. Complete and check any necessary rectification.

B. Reconnect all points where disconnection has been made during checking and rectification procedures.

R
R

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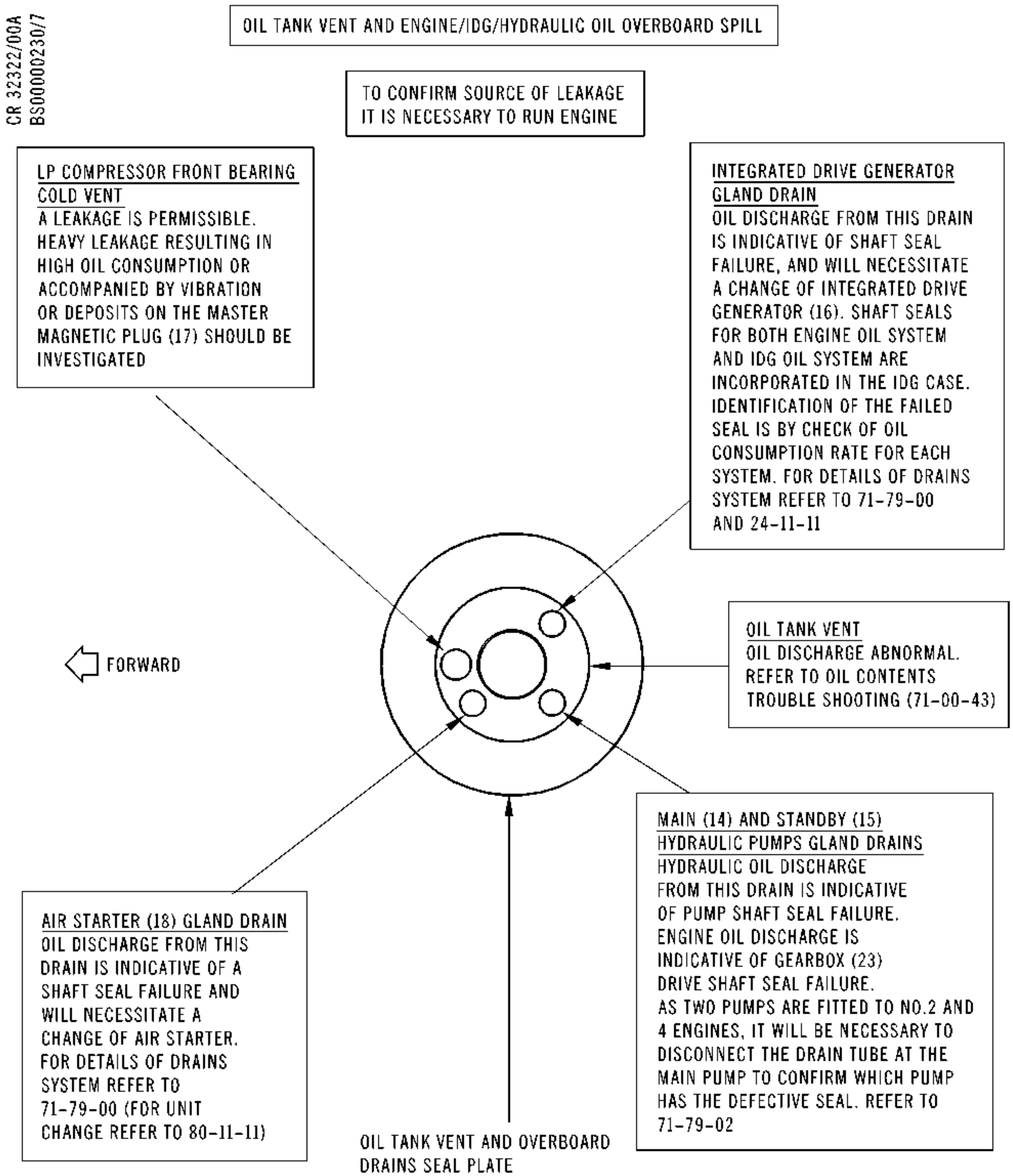
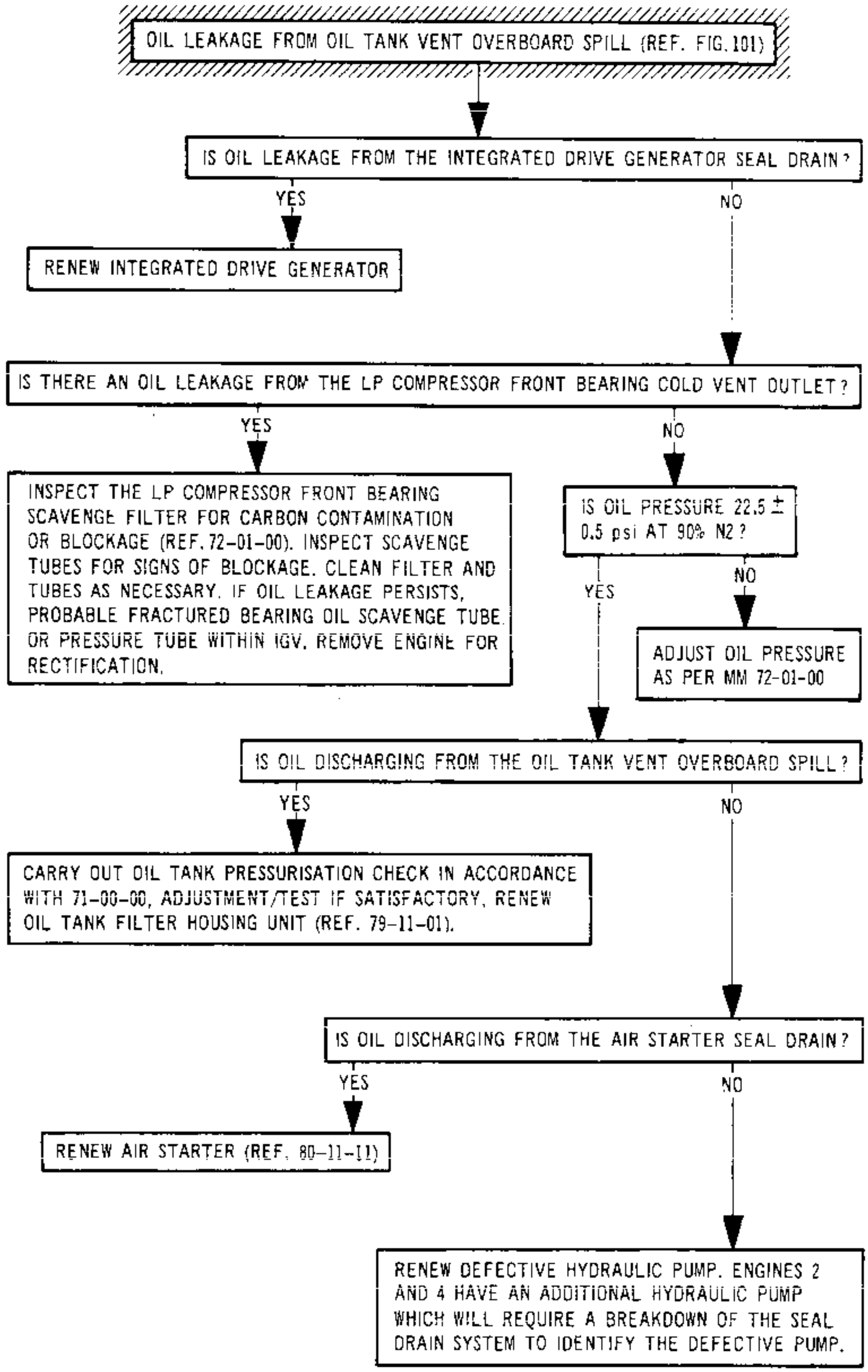


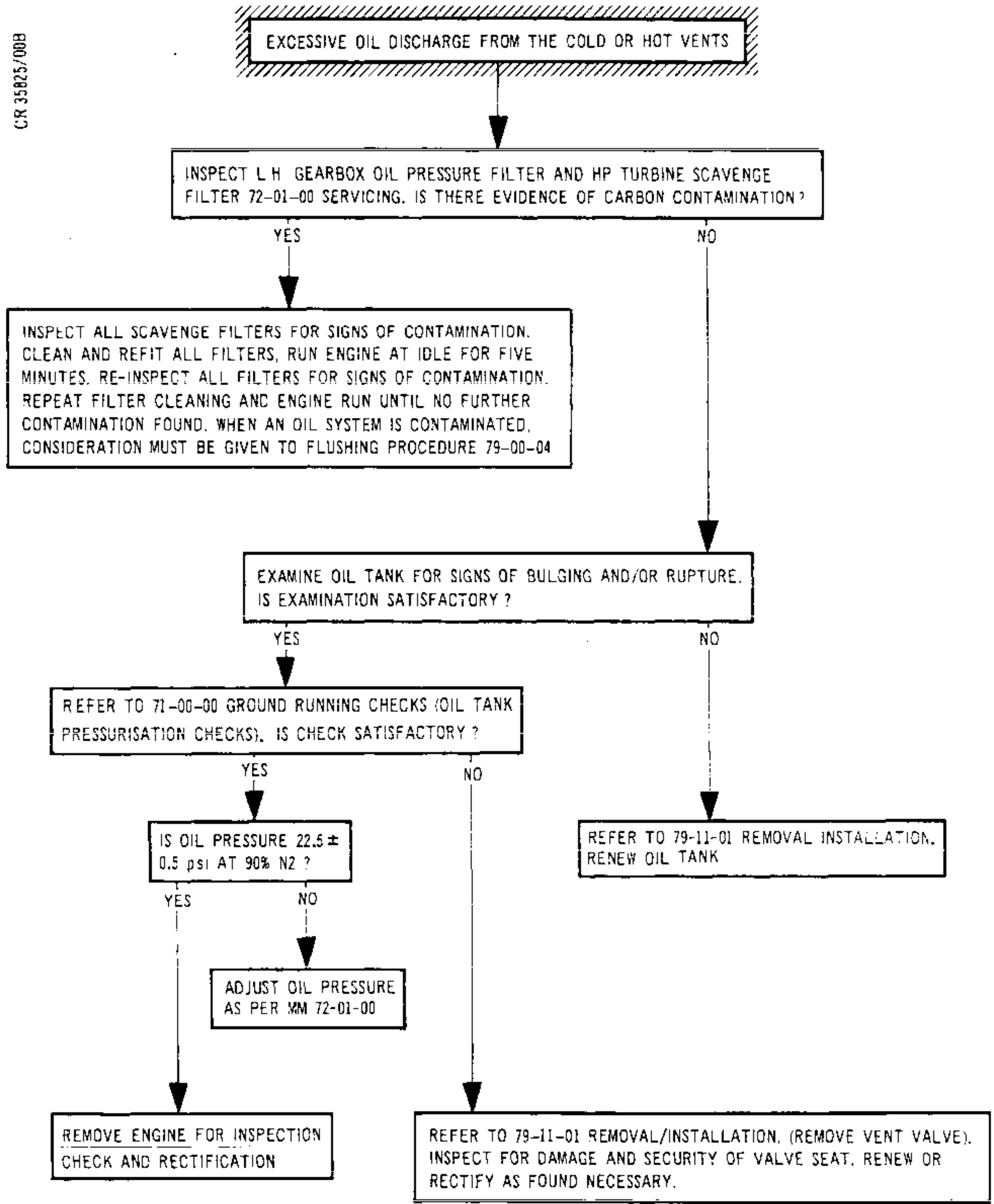
R Drain Identification
Figure 101

CR 35824/00C



R Chart 101

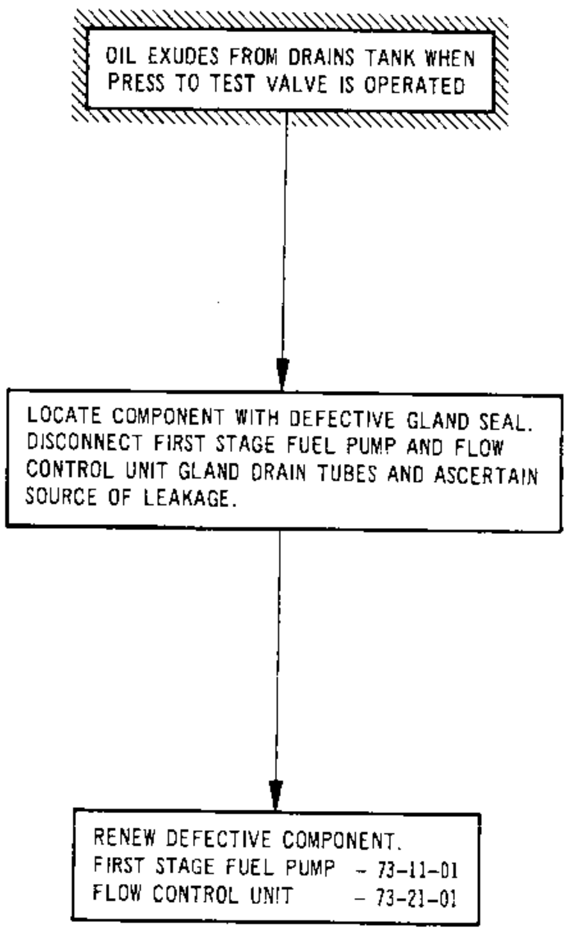
CR 35825/008



R

Chart 102

CR35826/00A



R

Chart 103

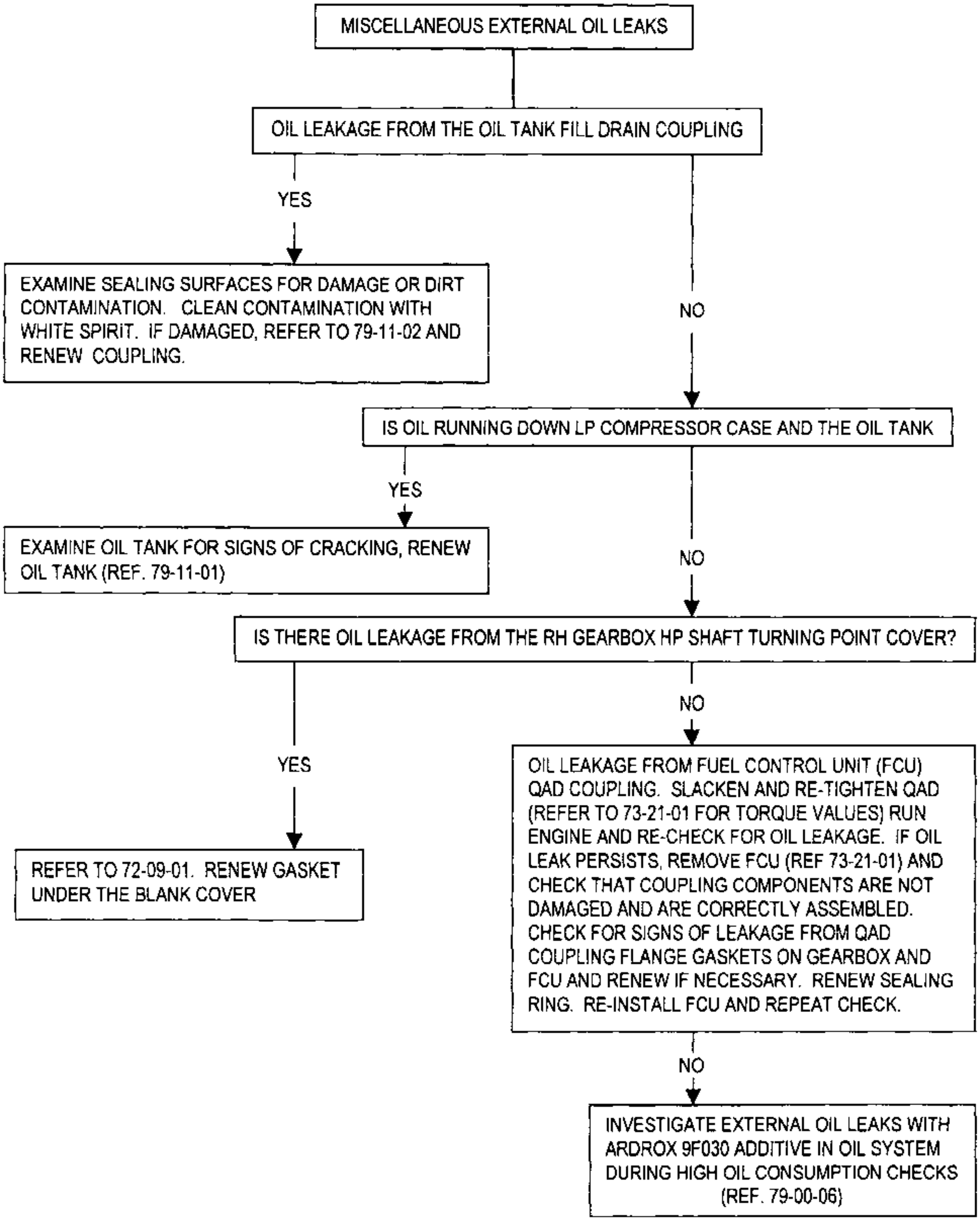


Chart 104 - CR 35827/00C

END OF THIS SECTION

NEXT

MOUNTS - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)

Each engine is suspended in its engine bay at four positions which allow thermal expansion and contraction of the engine independent of the engine bay structure.

The engine is positively located in its bay by a restraint spigot on top of the engine engaging with the wing bottom surface. It is supported by two main fail-safe mounts, one on each side of the engine, which are interconnected by a thrust balancing mechanism. Two other mounts support the forward end of the engine in alignment with the engine air intake. Each mount is secured to the wing bottom surface, but part of the thrust balancing mechanism is located in the wing-equipment bay above the engine.

Doors in the engine bay provide access to the main mounts while removable panels, in the wing top surface, provide access to the forward mounts and the thrust balancing mechanism.

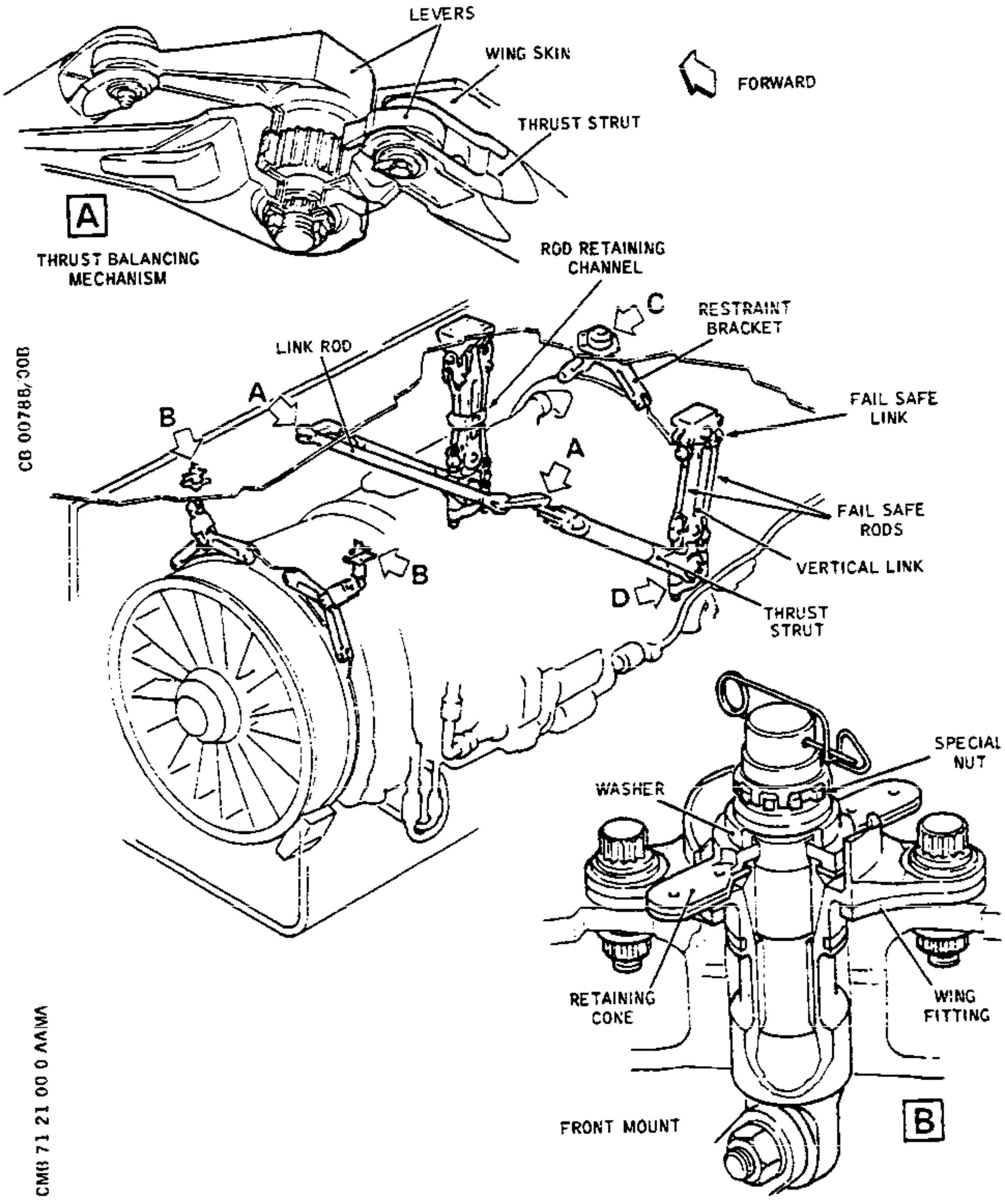
2. Main Mounts

The main mounts support the majority of engine weight and transmit engine thrust loads to the wing structure. Each mount consists of a trunnion secured to the engine delivery casing supported by a diagonal thrust strut and a vertical link. The vertical link is secured to a bracket on the wing, and the diagonal strut to a lever of the thrust balancing mechanism. Spherical bearings on the trunnion and on the vertical link permit movement due to expansion of the engine.

In addition two fail-safe links and two fail-safe rods, secured between the wing bracket and a fail-safe strap below the trunnion mounting, provide an alternative support for the engine in the event of failure of a vertical link and/or a trunnion mounting.

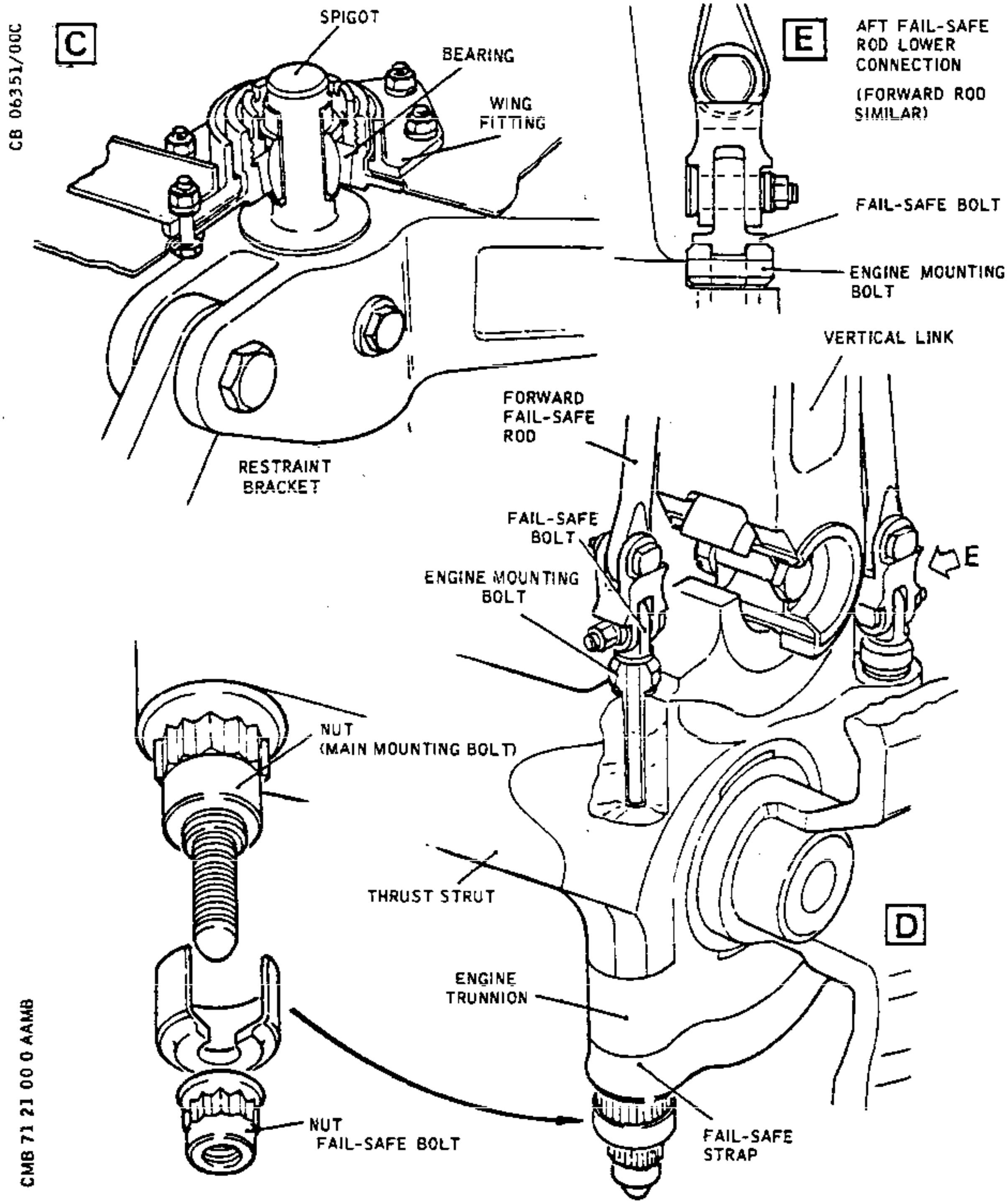
For engine removal the fail-safe strap is removed. This is accomplished by removing the nuts from the main and fail-safe mounting bolts. A trolley on the engine mounting nearest the centre wall, and a spigot-mounted roller on the outer engine mounting, are used in conjunction with ground equipment for engine removal and installation.

3. Forward Mounts



Engine Mounts (Sheet 1 of 2)
Figure 001

R



Engine Mounts (Sheet 2 of 2)
Figure 001

R

Two forward mounts, support the front of the engine, and
accommodate movement of the wing structure. Each of the
R mounts is identical and consists of three links bolted together
R at a common central point. The uppermost link is secured
R to a wing fitting, and the lower two links are secured to
R the forward flange of the engine low pressure compressor
R casing. Conical surfaces on the mounting, the retain-
R ing cone and wing-fitting, ensure a rigid attachment to the
R wing, and spherical bearings, fitted to the links, permit small
variations in engine length.

4. Restraint Bracket

The restraint bracket locates the engine laterally in the engine bay and transmits side loads on the engine to the wing structure. It consists of two link arms, bolted together, and secured on top of the engine delivery casing rear flange. One of the arms incorporates an integral spigot which engages with a spherical bearing housed in the wing bottom surface.

5. Thrust Balancing Mechanism

The mechanism minimizes engine movement resulting from engine operating thrust and structural deflection. It comprises two levers at each end of a link rod that interconnect the diagonal thrust struts of the main mounts. The levers which connect the link rod with the outer diagonal thrust strut are of unequal length and splined together, so that one is above and one is below the wing bottom surface. The remaining two levers nearer the nacelle centre wall are identical to those fitted to the opposite end of the rod except they are opposite hand and the upper lever is longer. The rod and those levers above the wing bottom surface are located in the wing equipment bay.

Unequal loading on the two main mounts, caused by the
direction of engine operating thrust, is balanced through
the levers across the link rod to maintain alignment,
within acceptable limits, between the engine air intake
R and the engine.

Printed in England

ENGINE THRUST BALANCE MECHANISM - REMOVAL/INSTALLATION

1. General

   This topic describes the removal and installation of the Engine Thrust Balance Mechanism and is common to all four engines. The purpose of this mechanism is to minimise movement and maintain alignment of the engine within acceptable limits. It is protected from the engine bay environment, by heatshields. The mechanism consists of two thrust struts connected to the engine mounts, one each side of each engine. The upper end of each thrust strut is connected to a bellcrank assembly and a link rod connects the two bellcranks.

2. Removal (Ref.Fig. 401)

   A. Prepare to remove

      (1) Remove the applicable engine(s) (Ref. 71-00-12).
      (2) Remove the wing access panel (Ref. 06-21-57) for the applicable engine:

         (a) For engine No.1 - panel No.534 AT
         (b) For engine No.2 - panel No.533 BT
         (c) For engine No.3 - panel No.633 BT
         (d) For engine No.4 - panel No.634 AT

      (3) Remove secondary heatshields from side and centre walls (Ref. 71-32-02).

   B. Removal of Link Rod

      (1) Remove and discard the split pin (1).
      (2) Remove nut (26) and bolt (25).
      (3) Remove nut (2), bonding leads (3), recessed washer (4) and lockwasher (5).
      (4) Remove the double ended bolt (6) and shaft (7) from threaded bush (24).
      (5) Repeat steps (1), (2), (3) and (4) for opposite end of the link rod (8).
      (6) Remove the link rod (8).

   C. Removal of the Bellcrank

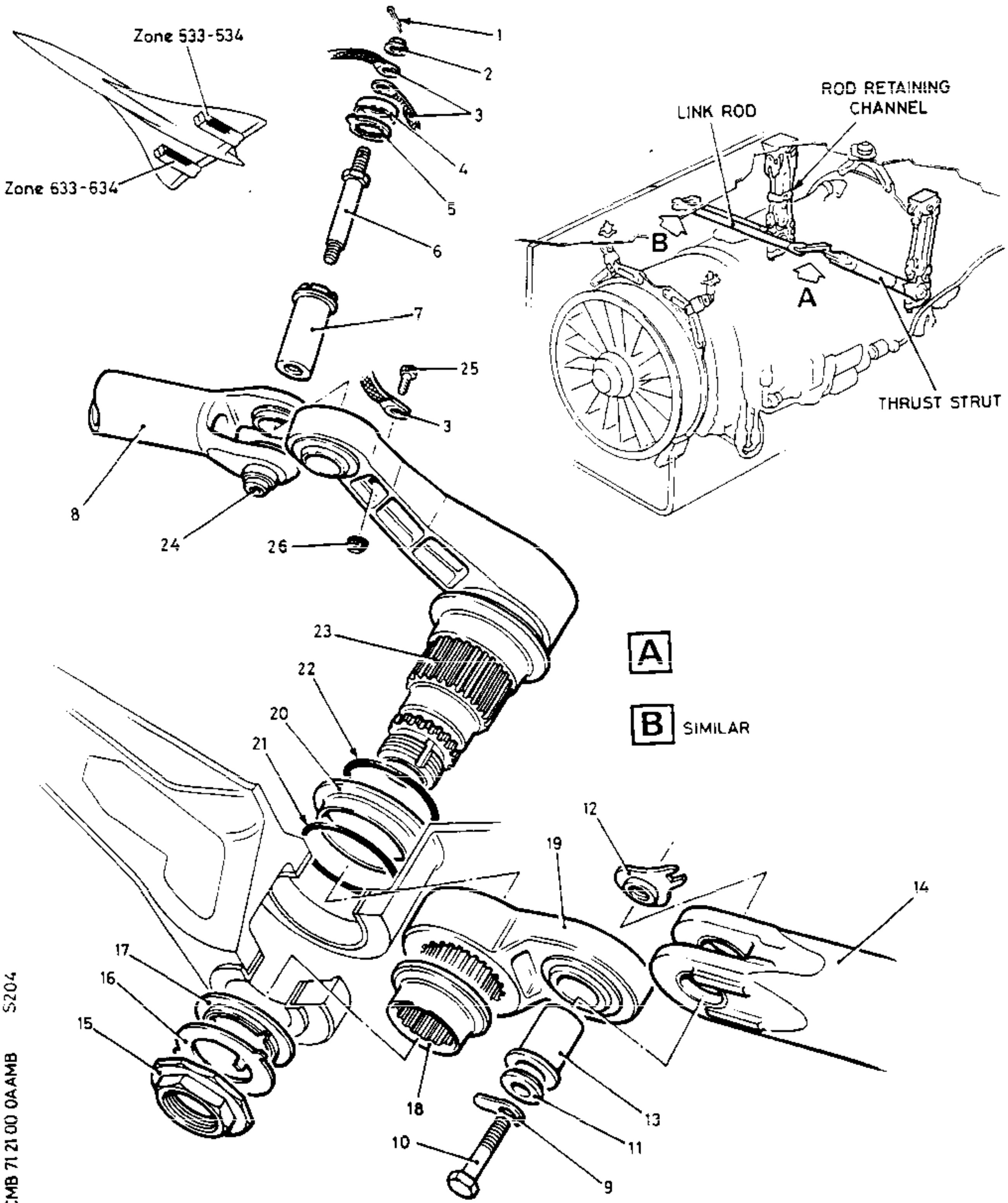
      (1) Remove the self locking nut (15), lockwasher (16) and shouldered bush (17).

         NOTE: Before removing the bellcrank ensure that the position of the two levers are marked for correct positioning when re-assembling.

      (2) Remove bellcrank (23) from the lever (19) and the aircraft structure, together with bush (20) and seals (21 and 22).

   D. Removal of Lever

      (1) Remove the bolt (10), bonding lug (9), retaining washer (11) and the special nut (12).



Engine Thrust Balancing Mechanism
Figure 401

(2) Remove the attachment pin (13) from lever (19) and thrust strut (14).
(3) Remove lever (19).

3. Installation (Ref. Fig. 401)

A. Installation of Bellcrank

(1) Ensure splined bush (18) is located in aircraft structure.
(2) Re-assemble seals (21 and 22) and bush (20) to the shaft of the bellcrank lever (23).
(3) Position lever (19) in aircraft structure.
(4) Insert the bellcrank lever (23) through the aircraft structure and lever (19), making sure the two levers align with the previously marked positions.
(5) Install bush (17) new lock washer (16) and self-locking nut (15). Torque tighten nut (15) to between 796 and 973 lbf in (9 and 11 mdaN) for engines two and three and between 973 and 1150 lbf in (11 and 13 mdaN) for engines one and four.

B. Installation of Link Rod

(1) Align the link rod (8) with bellcrank lever (23) and insert shaft (7).
(2) Install double ended bolt (6). Torque tighten the bolt to 265 lbf in (3 mdaN).
(3) Install the lock washer (5) and recessed washer (4).
(4) Install the two bonding leads (3), nut (2) and a new split pin (1).

C. Installation of Lever

(1) Align the lever (19) with the thrust strut (14) and insert the attachment pin (13).
(2) Position the special nut (12) and install the retaining washer (11), bonding lug (9) and bolt (10). Torque tighten the bolt to between 250 and 270 lbf in (2.80 and 3 mdaN).

D. Conclusion

(1) Install the secondary heatshields to sidewalls and centre walls (Ref. 71-32-02).
(2) Install the wing access panel (Ref. 06-21-57) for the applicable engine:

(a) For engine No.1 - panel No. 534 AT
(b) For engine No.2 - panel No. 533 BT
(c) For engine No.3 - panel No. 633 BT
(d) For engine No.4 - panel No. 634 AT.

(3) Install the applicable engine(s) (Ref. 71-00-12).

MOUNTS - INSPECTION/CHECK

1. General

This topic describes a visual inspection of the engine mounts airframe and engine attachments on engine removal. The main mounts are accessible with the engine bay doors open and the engine removed and secured in its support trolley. The engine location, front mount apertures and thrust balancing mechanism
R may be inspected from wing access panels which are removed
R for engine change.

2. Inspection/Check Following Engine Removal

NOTE: It is assumed the engine has been removed and placed on a layby trolley.

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner range: 40-50 lbf in (0.45 to 0.58 mdaN)	-
Lint free cloth	-

B. Prepare

(1) Wipe the mounts, where necessary, with a clean lint-free cloth.

R C. Inspect Airframe Parts of Engine Mountings

(1) On the inboard and outboard main mounts, starting from the heatshields at the top. Check the vertical and diagonal struts, the fail safe links, rods and retaining channel for visual damage.

(2) On the inboard and outboard main mounts, check for excessive slackness in the joint at the top of each fail safe rod, by attempting to move each rod up and down by hand. When slackness is found remove the shouldered bolt and check the condition of the rubber bush.

(a) Remove the shouldered bolt securing the top of each fail safe rod to each upper link.

(b) Check the general condition of each rubber bush.

(c) Check that each bush has no permanent set in excess of 0.010 in (0.25 mm).

(d) Secure each fail-safe rod to its upper link with a rubber bush, bolt and nut.

(e) Torque load the bolt to between 40 lbf in and 50 lbf in (0.45 and 0.58 mdaN).

(3) On the inboard main mount, check for rubbing and fretting between the retaining channel and the fail-safe rods.

(4) Check visually the security of all bolts securing the rods, links, and on the inboard mount, the retaining channel.

R (5) Check visually the position of the main and fail-safe
R bolts ensuring that they are correctly seated.

R (6) Check visually the condition of the threads on the main and fail-safe bolts and nuts. The nuts may be used a number of times.

R (7) Check for freedom of movement of the diagonal strut and the fail-safe rods.

R (8) Refer any damage found to the Table of Maximum Permissible Damage - Table 601.

R NOTE: Operations (9), (10) and (11) are carried out from the access panel apertures in the upper surface of the wing (Ref. 71-00-12, Removal/Installation).

R (9) At the engine location position, in the wing, (Ref Description and Operation) check the wing fitting, bearing and nut visually for damage.

R (10) At each front mount position, in the wing check the wing bracket and cone visually for damage, in addition check the condition of the nuts, washers and spring clips.

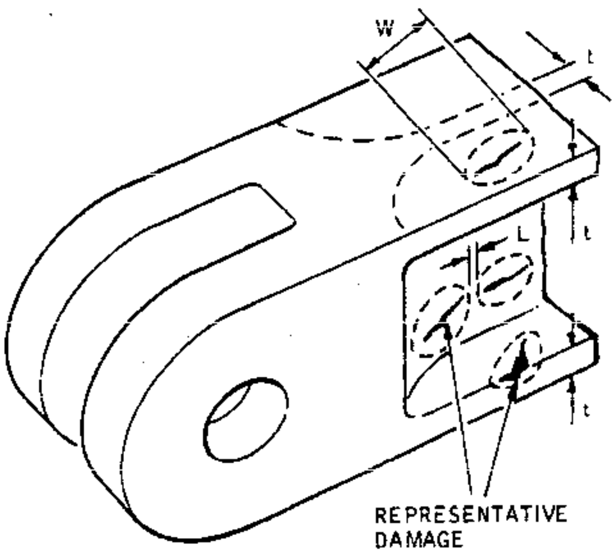
R (11) Check the thrust balance cross-shaft and levers for signs of damage, security and freedom of movement.

D. Inspect Engine Mounts

(1) On the engine, check each engine trunnion, spherical bearing, bearing housing and pin for visual damage. Check also the loose fail safe strap.

(2) On the engine, check the spigot assembly and heat-shield for visual damage, security and slackness. An assembly which shows signs of excessive wear at the joints should be removed for overhaul.

DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
SCORES AND ABRASIONS (MACHINED ITEMS LESS FAILSAFE RODS AND THRUST STRUT ASSEMBLIED)	Y max = $\frac{t}{10}$ or 0.015 in (0.38 mm) whichever is smaller



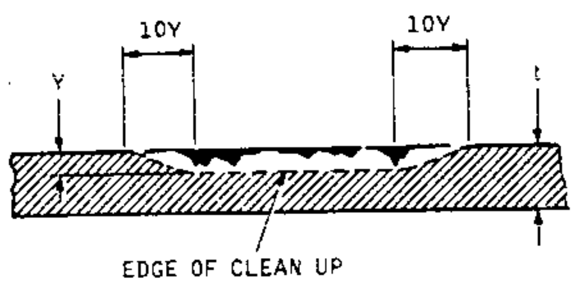
W max = 3.0 in (76.2 mm)

L min = 2.0 in (50.8 mm)

After blending out, the area must be polished and crack detected. Reprotect as required.

Grinding of titanium alloy items is not permitted.

NOTE: Where damage occurs at a change in thickness, Y is calculated using the lower value of t.



Y = Depth of blended-out area

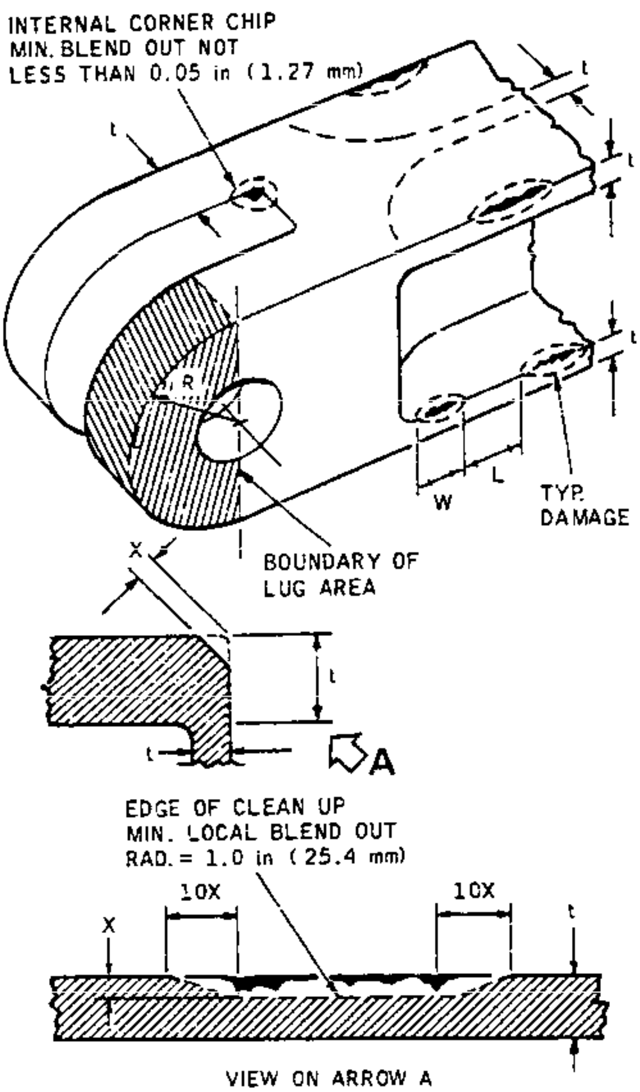
t = Local thickness

W = Dimension of blended-area

L = Distance apart (to blend out boundary)

Engine Bay Attach Fittings
Permissible Damage
TABLE 601A

DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
DAMAGED CORNERS	$X\ max = \frac{t}{4}$ or 0.05 in (1.27 mm) whichever is smaller



In lug areas and internal corners:

$X\ max = \frac{t}{8}$

or 0.03 in (0.76 mm) whichever is smaller

W max = 3.0 in (76.2 mm)

L min = 2.0 in (50.8 mm) along the edge

After blending out, the area must be crack detected. Reprotect as required.

Grinding of titanium alloy items is not permitted.

NOTE: The section thickness after blend-out must not be less than 0.9t at heel point where t is the thickness of the thinner flange.

X = Depth of blended-out area

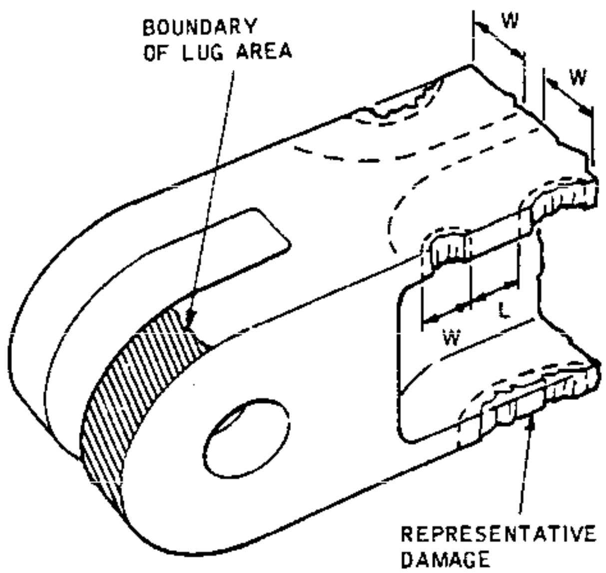
t = Local thickness

W = Length of blend-out

L = Distance apart (to blend-out boundary)

Engine Bay Attach Fittings
Permissible Damage
TABLE 601A (continued)

DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
DAMAGED EDGES	X max = $\frac{W}{10}$ or 0.05 in (1.27 mm) whichever is smaller



In lug areas:

X max = 0.03 in (0.76 mm)

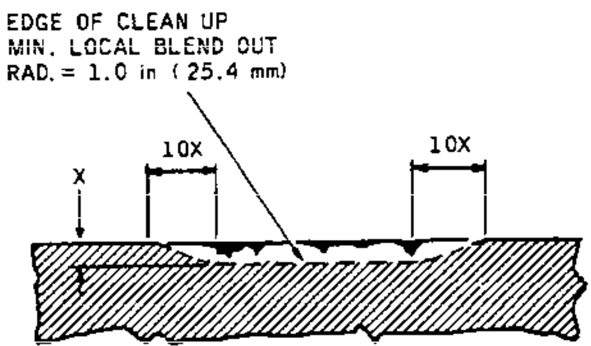
W max = 1.0 in (25.4 mm)

L min = 1.0 in (25.4 mm)

All edges damaged to within the above limitations are permitted at a transverse section.

After blending out, the area must be crack detected.
Reprotect as required.

Grinding of titanium alloy items is not permitted.



X = Depth of blended-out area

w = Dimension of blended-area

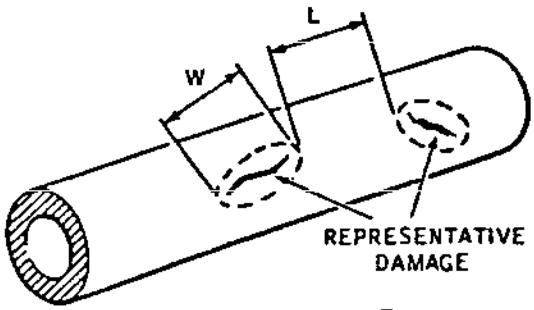
L = Distance apart (to blend out boundary)

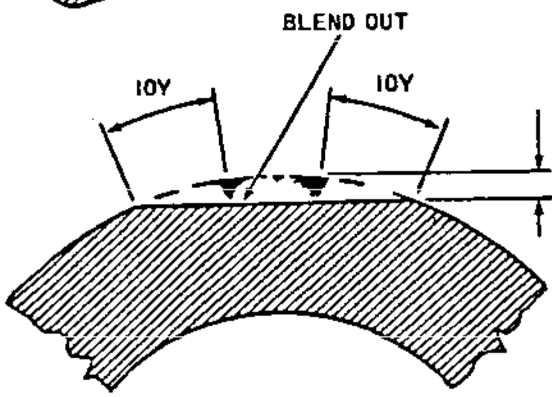
W = Dimension from web face to flange edge

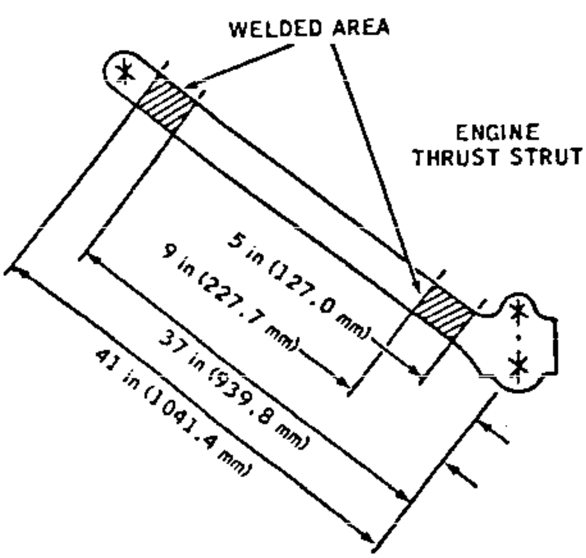
Engine Bay Attach Fittings
Permissible Damage
TABLE 601A (continued)

DAMAGE TYPE AND DESCRIPTION	LIMITATIONS

SCORES AND ABRASIONS
(THRUST STRUT ASSEMBLY
TUBULAR MEMBER)







Y max = 0.02 in (0.51 mm)

W max = 1.0 in (25.4 mm)

NOTE: W max must not extend beyond one-sixth of the circumference when measured around periphery.

L min = 2.0 in (50.8 mm)

After blending out, the area must be polished and crack detected.

Grinding of this titanium item is not permitted.

In engine thrust strut welded areas:

Y max = 0.008 in (0.20 mm)

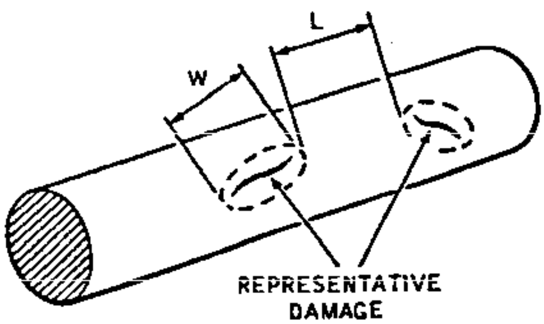
Y = Depth of blended-out area

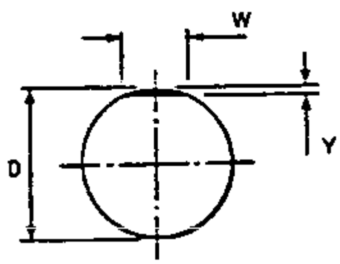
W = Dimension of blended-area

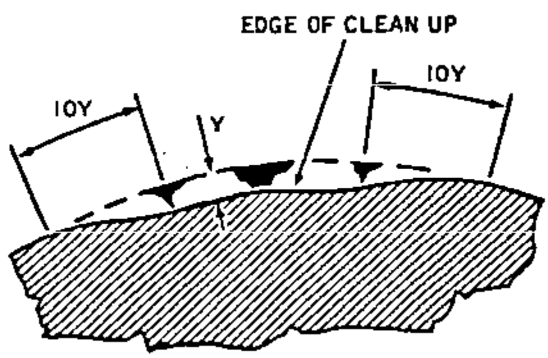
L = Distance apart (to blend-out boundary)

Engine Bay Attach Fittings
Permissible Damage
TABLE 601B (continued)

DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
SCORES AND ABRASIONS (MACHINED ITEMS - FAILSAFE ROD CIRCULAR BAR SECTION)	$Y \max = \frac{D}{30}$ or 0.015 in (0.38 mm) whichever is smaller W max = 1.0 in (25.4 mm) NOTE: W max must not extend beyond one-sixth of the circumference when measured around periphery. L min = 1.0 in (25.4 mm) After blending out, the area must be polished and crack detected. NOTE: Local overheating must be avoided if grinding is applied to hardened and tempered items.







Y = Depth of blended-out area

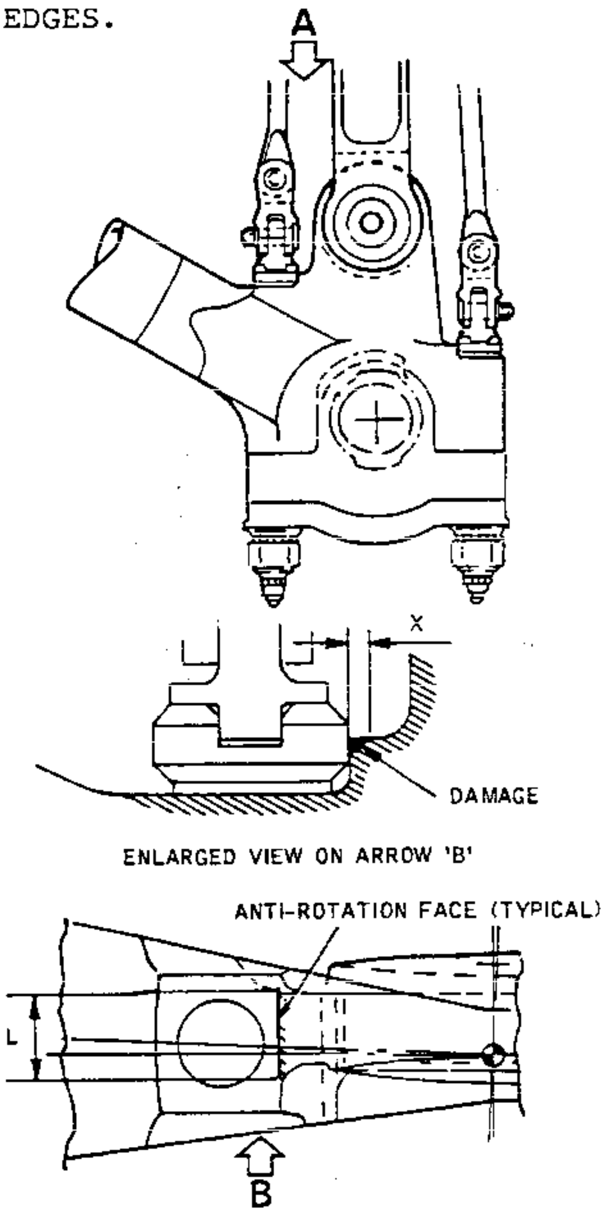
D = Local diameter of bar section

W = Dimension of blended-area

L = Distance apart (to blend-out boundary)

Engine Bay Attach Fittings
Permissible Damage
TABLE 601B (continued)

DAMAGE TYPE AND DESCRIPTION	LIMITATIONS
THRUST STRUT ASSEMBLY - DAMAGED EDGES.	TYPICAL FOR ALL ANTIROTATION FACES AT FAILSAFE LINKS. Blended out damage depth X at 45° along face L . X max = 0.02 in AT OTHER LOCATIONS PERMITTED DAMAGE IS SIMILAR TO LIMITATIONS DEFINED IN TABLE 601A. FOR DAMAGE ON TUBULAR MEMBERS SEE TABLE 601B. Note: Fail-Safe and Hollow Bolts local damage at the head is limited to 0.015 in depth. The damage is to be blended-out and polished and items crack detected. Where required surface treatment is to be restored. No splay of fork is allowed of the top link at the Fail-Safe rod assembly.
CRACKS (ALL ITEMS)	Not permitted Small edge cracks are to be treated as detailed in 'Damaged Edges' and 'Damaged Corners'.



Engine Bay Attach Fittings
Permissible Damage
TABLE 601C (concluded)

(3) On the engine, check each front mounting assembly for visual damage, security and slackness. An assembly which shows signs of excessive wear at the joints should be removed for overhaul.

INTAKE RINGS - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS IN 24-00-00.

1. General

Intake rings join the nacelle air intake diffuser and the engine. The assembly comprises three interconnected rings; an intake ring forward, intake ring aft and a joint ring. These may be removed and installed either separately or as an assembly.

Access to the rings is gained by opening the engine bay forward door.

2. Intake Joint Ring (Ref. Fig. 401)

A. Equipment and Materials

	DESCRIPTION	PART NO.
R	Locking wire (corrosion resistant steel)	DTD 189
R	0.031 in (0.8 mm) dia	
	Moly-paul powder No.3 (Ref. 20-30-00 No. 72) or	-
	Rocol A.S. powder (Ref. 20-30-00 No. 65)	-

B. Prepare to Remove Joint Ring

(1) Display a suitable placard on the engine starting panel to indicate that personnel are working in the power plant area.

(2) Open and support the engine bay forward door (Ref. 71-00-00, Servicing).

C. Remove Joint Ring

(1) Remove the nuts, location bracket and bolts securing the bracket to the joint ring.

(2) Remove the bolt and the bonding lead from the lug.

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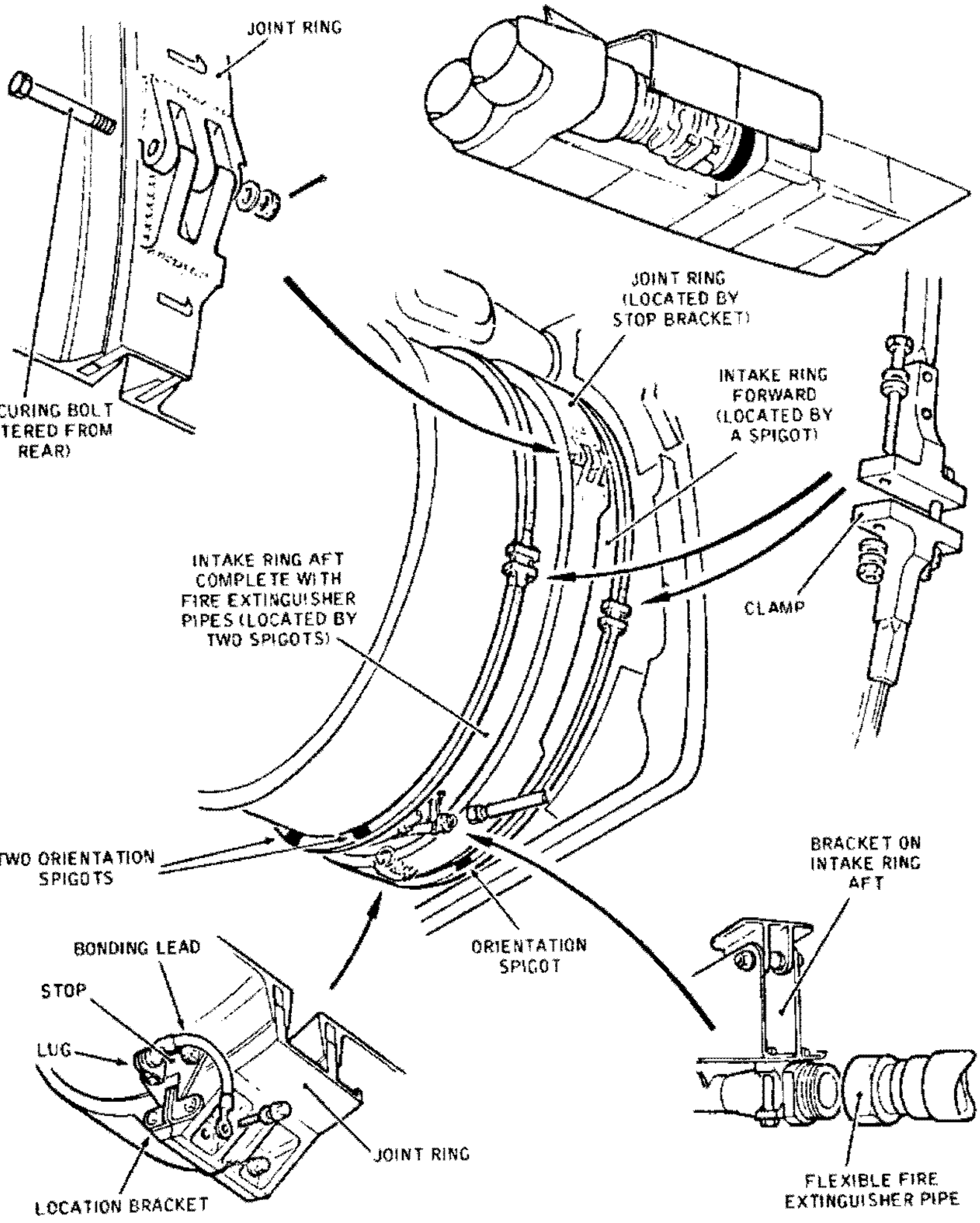

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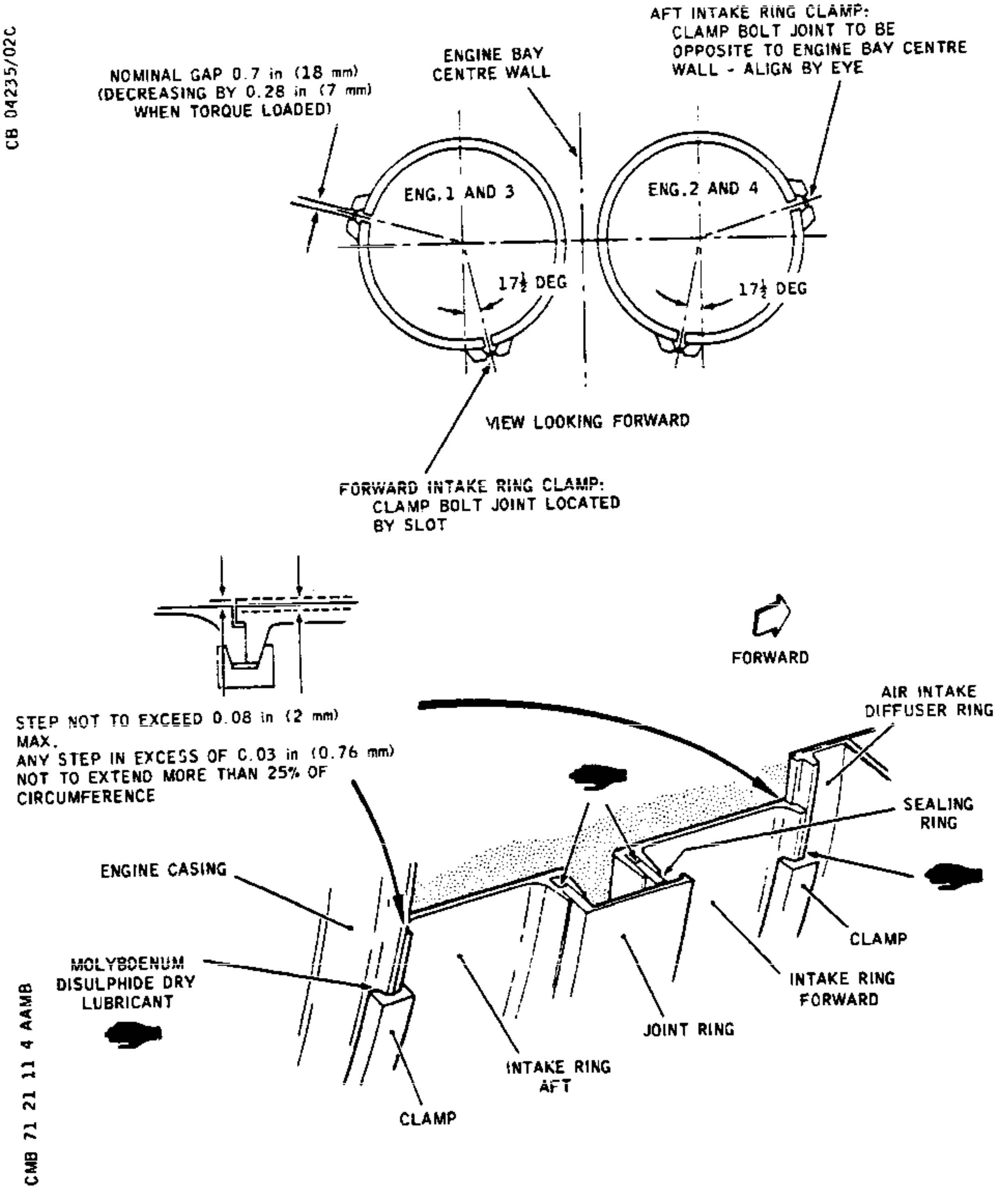
Intake Ring Installation (Sheet 1 of 2).
Figure 401

R



Intake Ring Installation (Sheet 2 of 2).
Figure 401

R

(3) Remove the bolts securing the lower segments together; retain the bonding lead.

(4) Manoeuvre the joint ring around the intake and remove it as a complete assembly.

(5) If it is necessary to strip down the joint ring into individual segments for inspection, remove the split pin, bolt, nut and washer securing each of the segments.

D. Prepare to Install Joint Ring

(1) Comply with the safety precautions in para. 2B.

(2) Ensure that the mating surfaces of the forward and aft intake rings are clean and undamaged.

NOTE: There are three segments in each joint ring. Each segment has an identification number, and is not interchangeable with a segment from another ring.

(3) Assemble the joint ring segments with the identification numbers as illustrated. Secure each pair of segments with a bolt washer and nut, the bolts being entered from the rear face of the joint ring. Torque load each bolt to between 25 and 30 lbf in (0.28-0.34 mdaN) and split pin.

(4) Apply Molybdenum Disulphide dry lubricant to the contact surfaces of the joint ring and the forward and aft intake rings (Ref. Fig. 401). Apply this lubricant also to the sealing ring; to assist this process deflect the springs.

E. Install Joint Ring.

NOTE: 1. The bonding lead is to be fitted in accordance with 20-27-12.

2. Torque load in accordance with 20-21-11.

R 3. Wire lock in accordance with 20-21-13.

(1) Engage the joint ring with the groove in the intake ring and manoeuvre the joint ring around the intake until the ends of the first and third segments are at roughly bottom dead centre.

(2) Secure the abutting edges of the first and third

segments together with washers and bolts, interposing the bonding lead beneath the head of the rearmost bolt. Do not tighten at this stage.

NOTE: Draw the segments together using a nut and a bolt of suitable length, inserted through the bracket centre hole.

(3) Position the joint ring so that the location bracket will engage the stop.

(4) Secure the bonding lead to the lug with a nut and bolt.

(5) Torque load the bolts securing the segment brackets
R together to between 70 and 80 lbf in (0.79 and 0.90 mdaN) and lock each bolt head to the centre hole of the joint ring with wire.

(6) Fit the location bracket and secure it with bolts and nuts. Torque load each bolt securing the location bracket to the joint ring to between 35 and 40 lbf in (0.39 and 0.45 mdaN).

F. Conclusion

(1) Ensure that the area is clean and close the engine bay forward door (Ref. 71-00-00, Servicing).

(2) Remove the placard from the engine starting panel.

3. Intake Rings Forward and Aft (Ref. Fig. 401)

A. Equipment and Materials

	DESCRIPTION	PART NO.
R R	Locking wire (corrosion resistant steel) 0.031 in (0.8 mm) dia.	DTD 189
	Moly-paul powder No.3 (Ref. 20-30-00 No.72) or Rocal A.S. powder (Ref. 20-30-00 No.65)	-

B. Prepare to Remove Intake rings

(1) Remove the joint ring (Ref. para. 2).

C. Remove the Forward Intake Ring

(1) Manually support the forward ring, release the clamp bolts securing it to the intake diffuser ring.

(2) Disengage the forward ring from the diffuser ring, and manipulate it around the intake, lower the ring and remove the clamp.

D. Remove the Aft Intake Ring

(1) Disconnect the fire extinguisher flexible hose from the pipe, fit cover blanks to the pipe end and union.

NOTE: When fire extinguisher pipes and fittings are to be removed from the aft intake ring refer to 26-21-00, Removal/Installation.

(2) Manually support the aft ring, release the clamp bolts securing it to the engine intake casing.

(3) Disengage the aft ring from the engine and remove the clamp.

E. Prepare to Install Intake Rings

NOTE: 1. Torque load nuts/bolts in accordance with 20-21-11.

2. Torque tighten fire extinguisher pipe coupling in accordance with 20-23-11.

R 3. Wirelock fire extinguisher pipe union nut in accordance with 20-21-13.

R (1) Comply with the safety precautions prior to
R entering the engine air intake (Ref. 71-00-00,
R Servicing).

(2) Ensure that the mating faces of the intake diffuser ring, the engine intake casing, and the forward and rear intake rings are clean and undamaged.

(3) Check that each clamp hinged segment is free to pivot.

F. Install Aft Intake Ring

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NOTE: If the fire extinguisher pipes on the rear intake ring have been removed or disturbed replace them in accordance with 26-21-00, Removal/Installation.

(1) Apply Molybdenum Disulphide dry lubricant to the contact faces of the clamp.

(2) Align the aft intake ring with the engine intake casing, ensuring that the orientation spigots are engaged with the associated slots on the engine intake casing.

(3) Support the ring and engage the mating flanges of the aft intake ring and the engine intake casing and retain them with the upper section of the clamp. Engage the lower section of the clamp to the upper section and secure it with bolts, washers, spherical bushes and nuts. Move the clamp around the intake until the bolted joints are at the position shown in the illustration (Ref. Fig. 401).

R WARNING: OBSERVE THE SAFETY PRECAUTIONS PRIOR TO
R ENTERING THE ENGINE AIR INTAKE (REF. 71-00-00,
R SERVICING).

R (4) Tighten the bolts evenly to a nominal torque, and
R adjust the position of the ring to give the
R minimum step across the internal surfaces of the
R ring and the engine casing. The step must not
R exceed 0.08 in (2 mm). Any step in excess of
R 0.03 in (0.76 mm) must not extend for more than
R 25% of the circumference (Ref. Fig. 401).

R (5) Torque load each nut to between 25 and 30 lbf in
(0.28 and 0.34 mdaN).

NOTE: Tension the bolts evenly.

R (6) Check the gap between the upper and lower sections
of the clamp; this should reduce from a nominal gap
of 0.7 in (17.78 mm) to approximately 0.42 in
R (10.67 mm).

R (7) Test for obstruction the fire extinguisher piping
and nozzles on the rear intake ring (Ref. 26-21-00,
Adjustment/Test).

R (8) Connect the fire extinguisher flexible hose,
torque load the union nut to between 300 and 330

R lbf in (3.39 - 3.73 mdaN), lock the nut with wire.

G. Install Forward Intake Ring

(1) Apply Molybdenum Disulphide dry lubricant to the contact faces of the clamp.

(2) Align the forward intake ring with the intake diffuser ring, ensuring that the orientation spigot is engaged with its associated slot on the diffuser ring.

(3) Support the ring and engage the mating flanges of the forward intake ring and the intake diffuser ring and retain them with the clamp in a similar manner to that described for the aft clamp, but in this instance the clamp will be located by the spigot with the bolted joints as shown in the illustration (Ref. Fig. 401).

R R R WARNING: OBSERVE THE SAFETY PRECAUTIONS PRIOR TO ENTERING THE ENGINE AIR INTAKE (REF. 71-00-00, SERVICING).

R R R R R R R (4) Tighten the bolts evenly to a nominal torque, and adjust the position of the ring to give the minimum step across the internal surfaces of the forward ring and the intake diffuser ring. The step must not exceed 0.08 in (2 mm). Any step in excess of 0.03 (0.76 mm) must not extend for more than 25% of the circumference (Ref. Fig. 401).

R R (5) Torque-tighten each nut to between 25 and 30 lbf in (0.28 and 0.34 mdaN).

H. Conclusion

(1) Install the joint ring and close the engine bay doors as described in para 2.

R R R (2) Carry out the relevant safety precautions and procedures following exit from the engine air intake (Ref. 71-00-00, Servicing).

4. Complete Intake Ring Assembly (Ref. Fig. 402)

A. Equipment and Materials

DESCRIPTION	PART NO.
R Locking wire (corrosion resistant R steel) 0.031 in (0.8 mm) dia.	DTD 189
Moly-paul powder No.3 (Ref. 20-30-00 No.75) or Rocol A.S. powder (Ref. 20-30-00 No.65)	-

B. Prepare to Remove Intake Ring Assembly

R (1) Comply with the safety precautions prior to entering
R the engine air intake (Ref. 71-00-00, Servicing).

(2) Open and support the forward engine bay door (Ref. 71-00-00, Servicing).

(3) Counting from the centre wall outwards, remove four engine bay door seal plates.

(4) Disconnect the fire extinguisher flexible hose from the piping on the aft intake ring. Fit covers to the pipe end and union.

C. Remove Intake Ring Assembly

(1) Manually support the aft intake ring and disconnect the segmented clamp securing it to the engine intake casing.

(2) Contract the intake ring assembly as much as possible by pushing the aft intake ring forward.

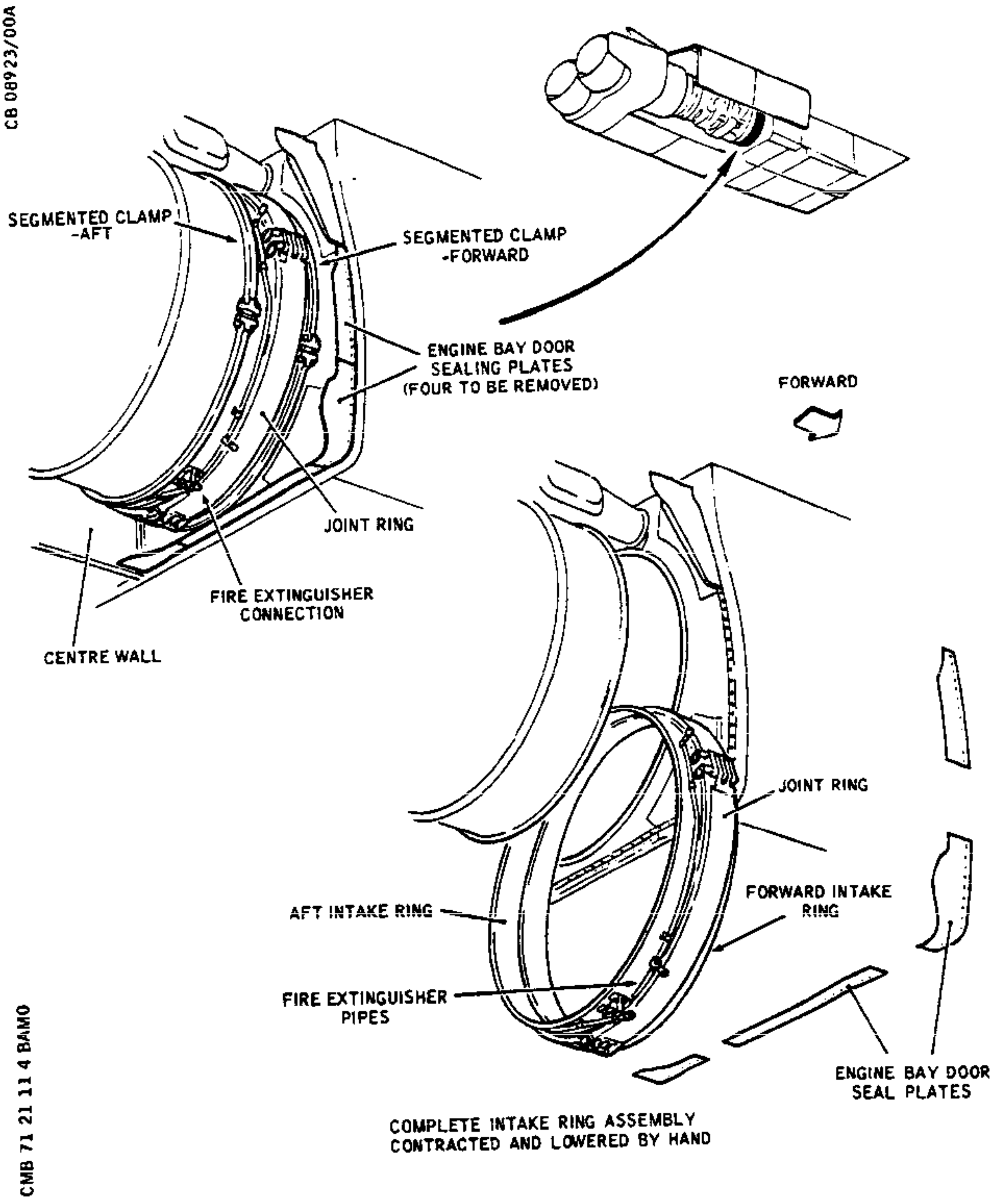
(3) Support the intake ring assembly and disconnect the
R segmented clamp securing it to the diffuser ring.

(4) Lower the intake ring assembly.

<u>NOTE</u>: Weight of ring assembly is approximately 65 lb (29 Kg).

D. Prepare to Install Intake Ring Assembly

(1) If the fire extinguisher pipes on the aft intake ring have been disturbed, refit in accordance with (Ref. 26-21-00, Removal/Installation).



Complete Intake Ring Assembly - Installation
Figure 402

(2) If the joint ring has been disturbed, refit (Ref. Fig. 401). Fit the electrical bonding lead, and torque-load and wire-lock the bolts as detailed in para. 2E.

(3) Lubricate the contact surfaces of the intake, engine, rings and segmented clamps with molydenum disulphide dry lubricant.

E. Install Intake Ring Assembly

(1) Lift the intake ring assembly into position and secure it to the intake diffuser ring with the segmented clamp, ensuring that the locating spigot is engaged in the associated slot on the diffuser ring. Tension the segmented clamp bolts sufficient to retain the assembly.

(2) Push the aft intake ring into contact with the engine flange and secure with the segmented clamp.

WARNING: OBSERVE THE SAFETY PRECAUTIONS PRIOR TO ENTERING THE ENGINE INTAKE (REF. 71-00-00, SERVICING).

(3) Adjust the position of the assembly to give the minimum step on the internal surface at the junction of the forward intake ring with the intake diffuser ring, and the aft intake ring with the engine casing. The step must not exceed 0.08 in (2 mm). Any step in excess of 0.03 in (0.76 mm) must not extend for more than 25% of the circumference (Ref. Fig. 401).

(4) Torque-load the bolts securing the forward and aft segmented clamps and the fire extinguisher flexible hose as in para.3F. Check that clearances are as shown in the illustration (Ref. Fig. 401).

F. Conclusion

(1) Refit the four engine bay door seal plates previously removed. Torque-load the securing screws to between 30 and 40 lbf in (0.339 and 0.452 mdaN).

(2) Close the engine bay forward door (Ref. 71-00-00, Servicing).

(3) Carry out the relevant safety precautions and procedures following exit from the engine air intake (Ref. 71-00-00, Servicing).

R INTAKE RINGS - INSPECTION/CHECK

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS IN 24-00-00.

1. General

This topic describes an Inspection/Check of a sealing ring on the intake ring forward assembly.
It is assumed that this inspection would normally be carried out when the intake rings have been removed for other servicing tasks.

2. Sealing Ring Inspection

A. Equipment and Materials

DESCRIPTION	PART NO.
Kimwipe tissue	-
Micrometer range 0-1 in (0-25 mm)	-
R Micrometer range 0 - 2 in R (0-50 mm)	-

B. Prepare

NOTE: Sealing rings are either anodised or tungsten carbide coated.

(1) Remove the joint ring and forward intake ring (Ref. 71-21-11) Removal/Installation.

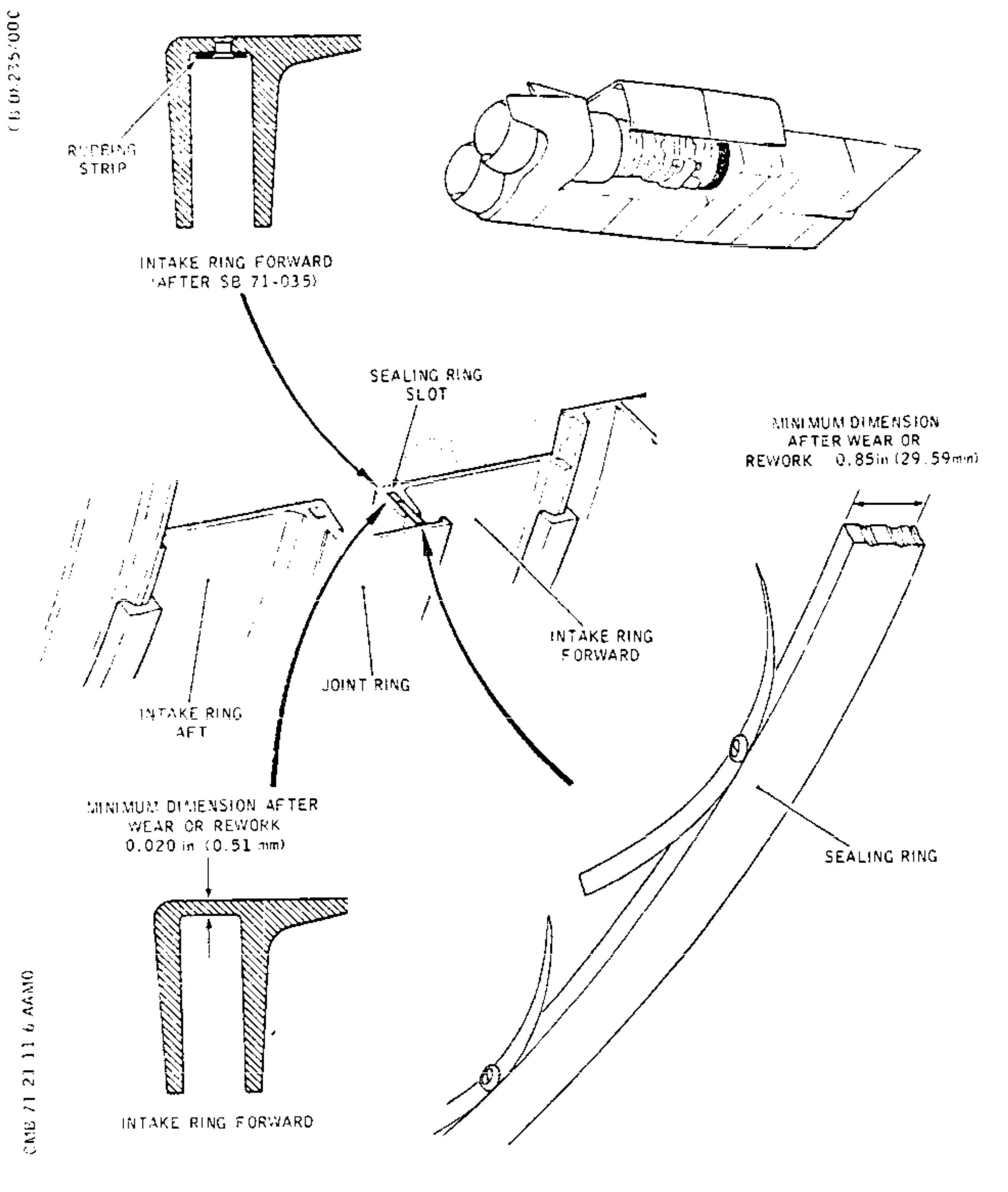
C. Inspection (Ref. Fig. 601)

(1) Place the intake ring forward assembly on a bench with the sealing ring uppermost.

(2) Remove the sealing ring from the slot by expanding the ring sufficiently to clear the slot.

CAUTION: DO NOT USE EXCESSIVE FORCE OTHERWISE THE SEALING RING WILL DISTORT.

(3) Clean the ring and its housing slot.



Intake Ring - Inspection
Figure 601

R

B (4) Visually inspect the surface of the sealing ring for wear.
B When wear damage is perceptible on the sides, provided the
B thickness of the ring is within the limits in (5) below,
B the damage may be blended out to a depth not exceeding
B 0.050 in. This is acceptable provided blending does not
B cover more than 40% of one side of the ring.
B Protect blended area with Alochrome 1200.

(5) Check the thickness of the ring radially taking care to measure the ring only and not the springs. The minimum dimension after wear or reworking is 0.85 in (21.59 mm) otherwise the ring must be rejected.

(6) Visually inspect the bottom of the sealing ring groove for evidence of wear due to contact with the ends of the sealing ring springs.

(7) Where there is evidence of wear, measure and record the position and depth of wear for monitoring at the prescribed inspection periods:

(a) Wear up to a maximum depth of 1.39 mm (0.055 in) is acceptable, providing the minimum thickness at the bottom groove is not less than 0.51 mm (0.020 in).

RB (b) When the metal thickness is found to be less than
RB 0.51 mm (0.020 ins) at any point, repair the ring in
RB accordance with repair B.O.R.501.

(8) Install the existing or replacement ring into the forward intake ring slot:

(a) Apply Molybdenum disulphide dry lubricant to the working surfaces of the slot and sealing ring

(b) Align the gap in the sealing ring with the spigot in the intake ring (Ref. 71-21-11, Removal/Installation).

(c) Spread the sealing ring, the minimum amount necessary for the springs to clear the edge of the slot, and install the ring progressively into the slot.

D. Conclusion

(1) Replace the intake ring forward and joint ring (Ref.71-21-11)

RB 3. WELD REPAIR OF FRETTED INTAKE RING

RB A. APPLICATION Intake ring Pt.No.E52171000052 I.P.C.
RB Ref.71-21-10 Fig. 11-345.

RB B. INSTRUCTIONS Intake rings that fail inspection Ref.M.M.
RB Chapter 71-21-11 Page 601. 2 C (7), can be
RB repaired as follows:

RB (1) Dress areas of frettage using an air powered grinding
RB wheel.
RB (2) Thoroughly clean area to be welded with Genklene.
RB (3) Weld areas of frettage using Argon Arc process.
RB (a) Filler Rod TCPWR 18G (MS9500-70)
RB (b) Current 25 AMPS
RB (c) Argon Flow Rate 20 Cu.Ft/HR
RB (4) Dress weld bead back to original profile.
RB (5) Crack detect using dye penetrant method.
RB (6) Using vibro percussion engraving technique add this
RB repair number to the existing part number.

ENGINE THRUST STRUT ASSEMBLIES - REMOVAL/INSTALLATION

1. General

The thrust strut assemblies are a part of the engine mountings and transmit the engine thrust loads to the wing structure. They also form part of the thrust balancing mechanism geometry. Various services are attached to the outboard/inboard thrust strut assemblies. The front attachments are protected from the engine bay environment by the engine bay secondary heatshields. The removal/installation procedure is similar for all four engine bays.

2. Centrewall Thrust Struts (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner 0-270 lbf in (0-3.05 mdaN) range	-
Pin Extractor	E925153000
R Corrosion resistant steel wire R 0.036 in (1.02 mm) dia	DTD189

B. Prepare to Remove

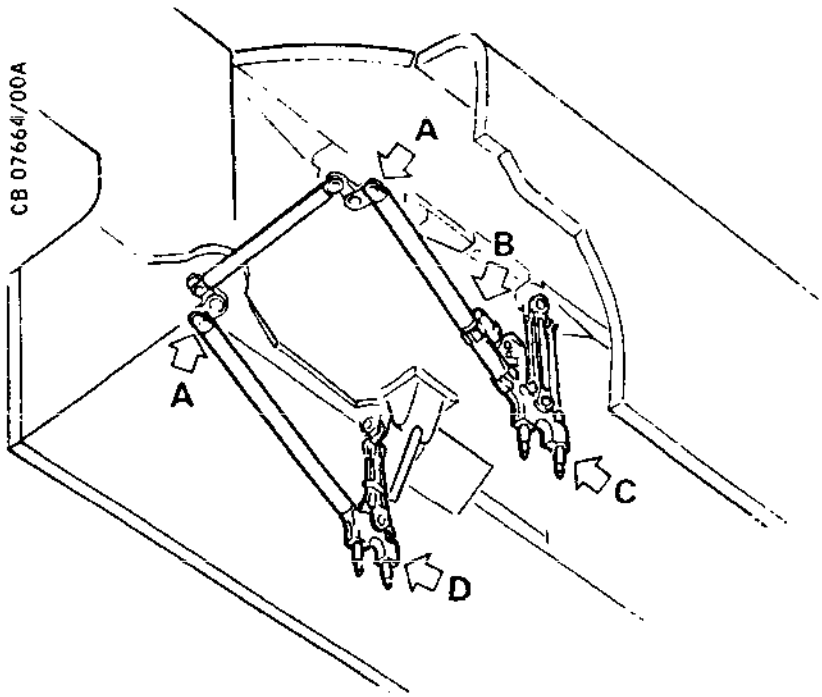
(1) Remove the engine (Ref. 71-00-12, Removal/ Installation).

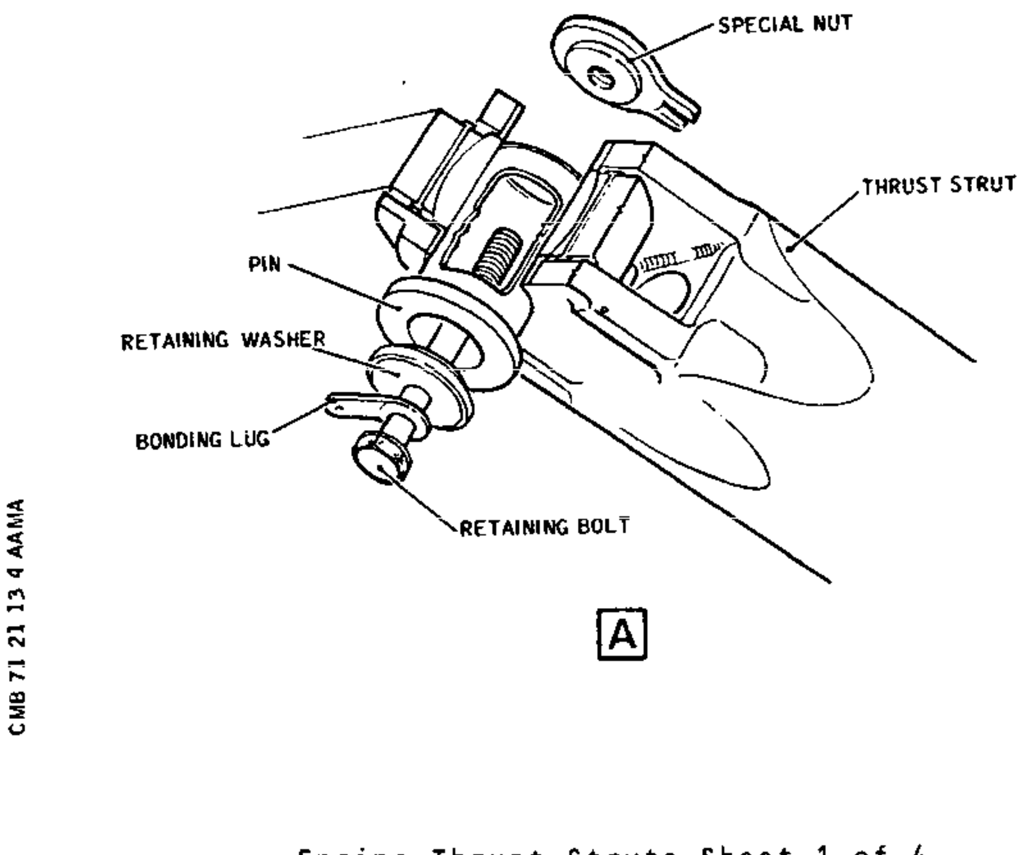
(2) Remove the secondary heat exchanger (Ref. 21-12-14, Removal/Installation).

(3) Remove the necessary secondary heatshields to gain access to the forward attachment (Ref. 71-32-13, Removal/Installation).

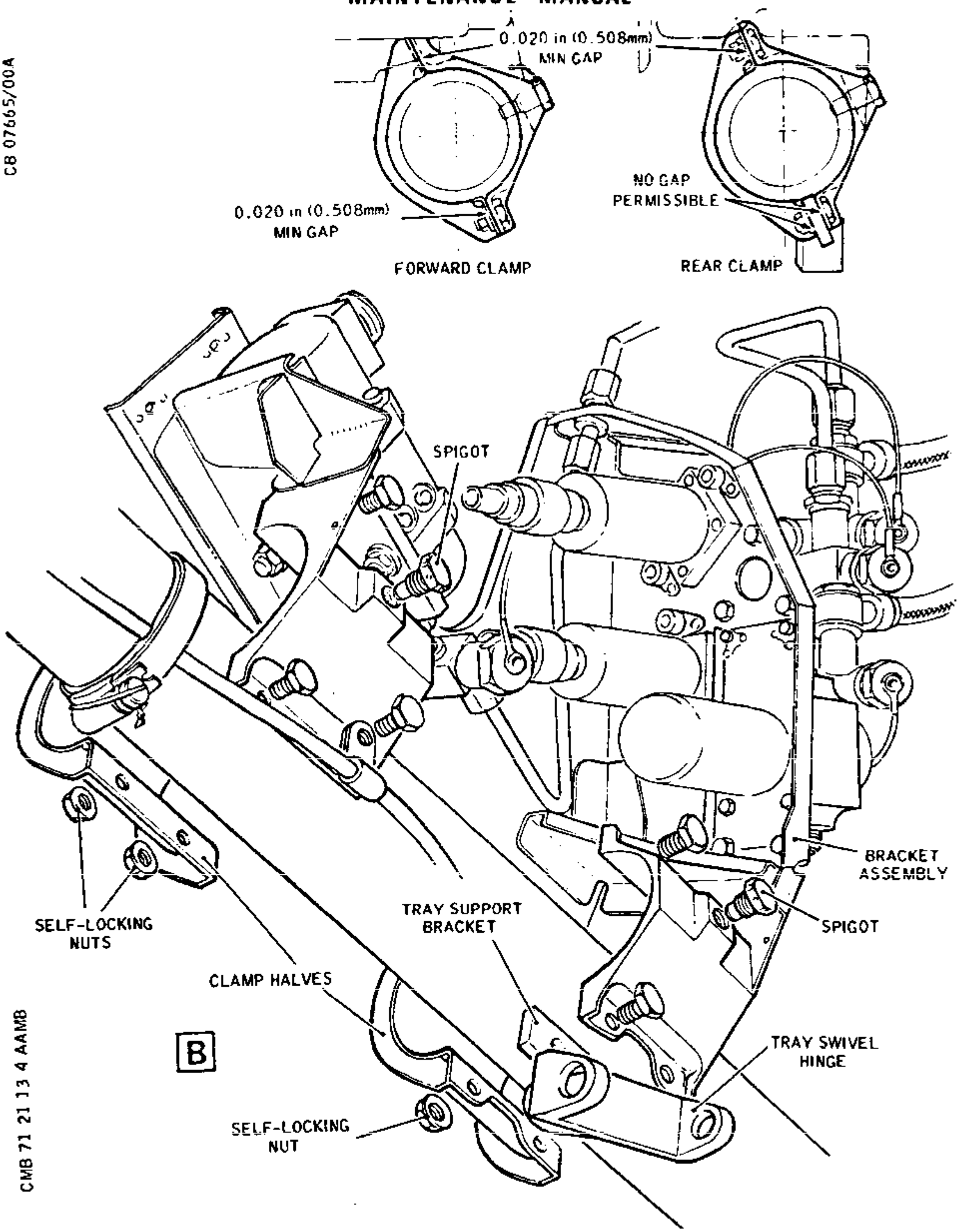
(4) Remove the eight bolts and washers from the fail safe rod retaining channels and remove the channels (Ref. Fig. 401)(Detail D).

(5) Remove the lower nuts and bolt from the fail safe rod upper links (Ref. Fig. 401)(Detail D).





Engine Thrust Struts Sheet 1 of 4
Figure 401



Engine Thrust Struts Sheet 2 of 4
Figure 401

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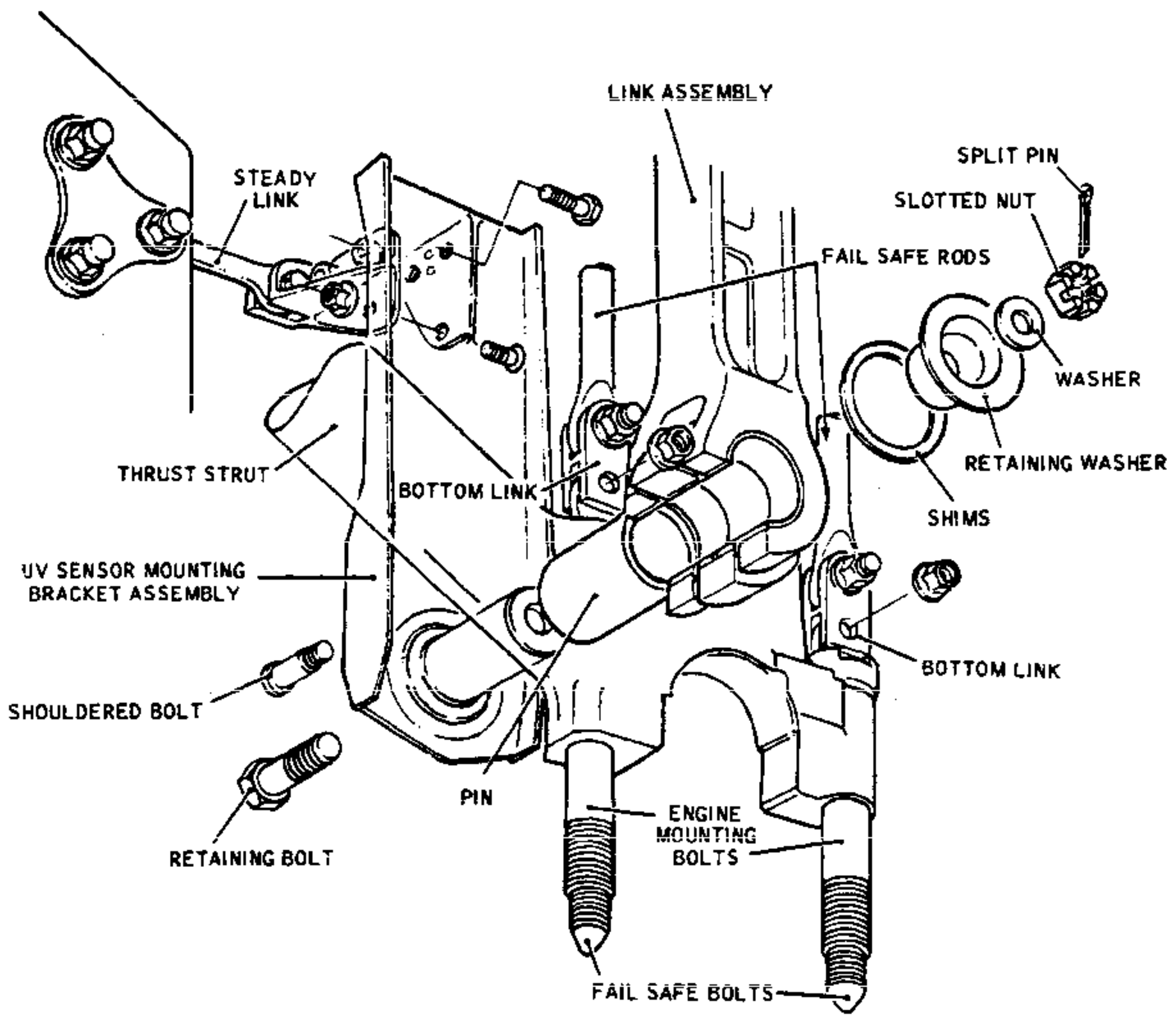

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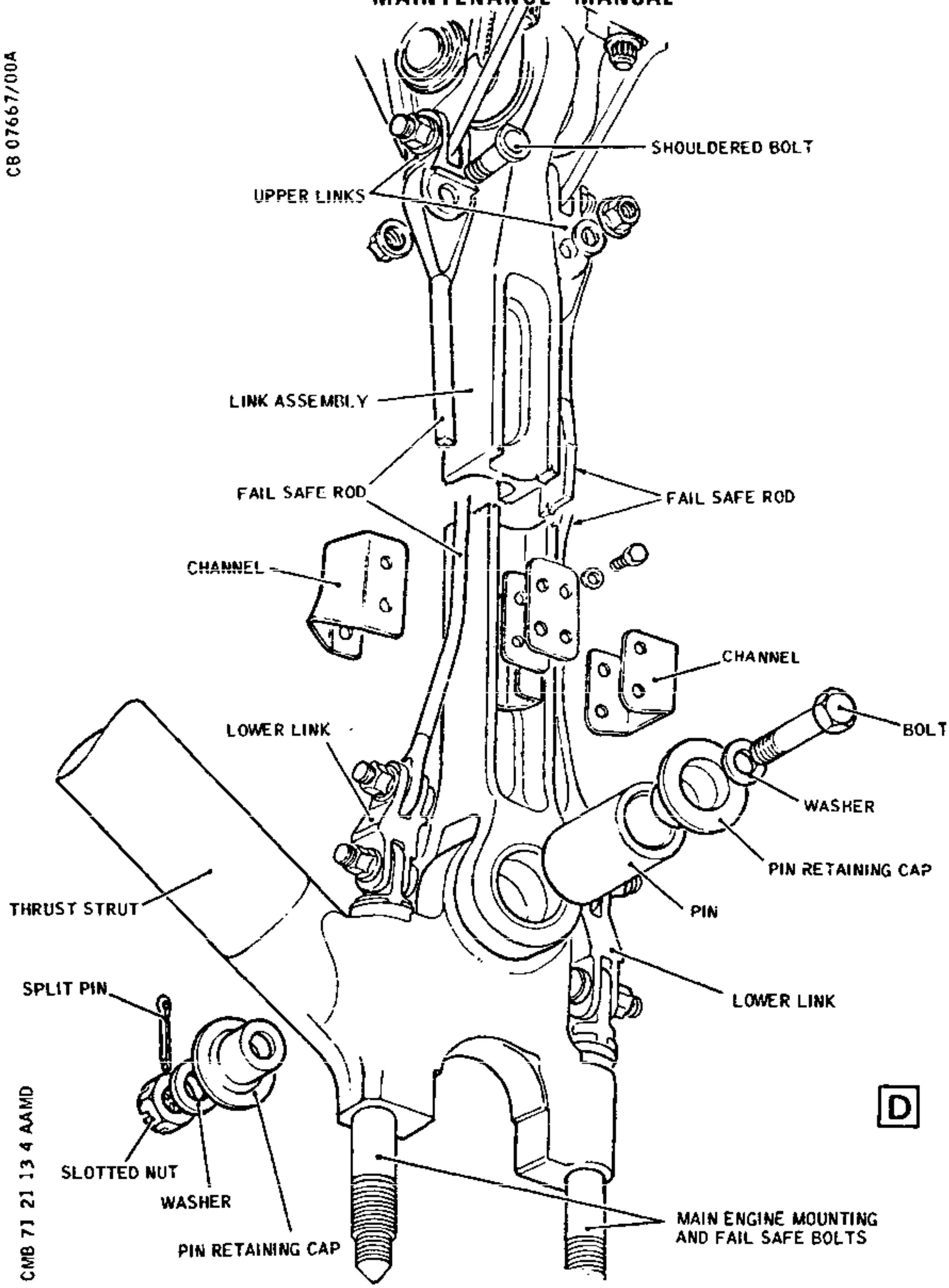
Engine Thrust Struts Sheet 3 of 4
Figure 401

R



Engine Thrust Struts Sheet 4 of 4
Figure 401

(6) Remove the fail safe rods complete with the fail safe and main engine mounting bolts, special washers and shims. Note the positions for subsequent installation.

C. Remove Centrewall Thrust Strut Assembly.

(1) Disconnect the bonding strip from the bonding lug, remove the special bolt, bonding lug, retaining washer and special nut from the forward attachment (Ref. Fig. 401) (Detail A).

(2) Remove the slotted nut, washers, bolt and pin retaining caps from the main engine mounting location (Ref. Fig. 401)(Detail D).

(3) Manually support the strut and remove the forward attachment pin, if necessary use the extractor tool E925153000. Remove the main engine mounting pin and remove the strut rearwards to clear the forward attachment.

<u>NOTE</u>: When using the extractor tool, ensure that the correct size spigot is used. A direct pull
R with no twisting action must be used during pin extraction.

D. Install Centrewall Thrust Strut Assembly

(1) Ensure that the thrust strut assembly, link assembly attachment pins, retaining caps, special nut and retaining washer are undamaged.

(2) Position the strut to align with the forward and the main engine mounting attachment locations, insert the attachment pins in their respective positions.

(3) Position the special nut and fit the special bolt, bonding lug and retaining washer (Ref. Fig. 401)
R Detail A. Torque-tighten the bolt to between 250 and
R 270 lbf in (2.82 and 3.05 mdaN) and wire-lock the bolt.

(4) Reconnect the bonding strip to the bonding lug (Ref. 20-27-12).

(5) Position the pin retaining caps at the main engine mounting location and retain them with the bolt, washers and slotted nut (Ref. Fig. 401) Detail D.
R Torque-tighten the slotted nut to between 160 and 180
R lbf in (1.81 and 2.03 mdaN) and lock the nut with

a split pin.

(6) Ensure that the fail safe rods, bolts, retaining channels and the main engine mounting bolts are undamaged, ensure that the fail safe rod rubber bushes and the support bracket anchor nuts are serviceable.

(7) Fit the shims and install the main engine mounting bolts into their locations, fit the special washer and insert the fail safe bolts (with the fail safe rods still attached) through the main engine mounting bolts.

(8) Align the fail safe rods with the upper links and secure with the shouldered bolts and nuts. Torque-
R tighten the nuts to between 40 and 50 lbf in (0.45 and
R 0.57 mdaN).

(9) Fit the fail safe rod retaining channels to the support brackets and retain them with the bolts and washers (Ref. Fig. 401)(Detail D). Torque-tighten the
R bolts to between 40 and 50 lbf in (0.45 and 0.57 mdaN)

(10) Install the secondary heatshields (Ref. 71-32-13, Removal/Installation).

(11) Install the secondary heat exchanger (Ref. 21-12-14, Removal/Installation).

(12) Install the engine (Ref. 71-00-12, Removal/ Installation),

3. Inboard/Outboard Thrust Struts

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner 0-270 lbf in (0-3.05 mdaN) range	-
Teflon pressure sensitive tape (Ref. 20-30-00, No.139)	-
Pin Extractor	E925153000

DESCRIPTION	PART NO.
R Corrosion-resistant steel wire 0.036 in (1.02 mm) dia	DTD189

B. Prepare to Remove

(1) Remove the engine (Ref. 71-00-12, Removal/Installation).

(2) Remove the primary heat exchanger (Ref. 21-12-11, Removal/Installation).

(3) Remove the necessary secondary heatshields to gain access to the forward attachment (Ref. 71-32-13, Removal/Installation.

(4) Remove the bolt, nut and washer retaining the steady link bracket (Ref. Fig. 401)(Detail C).

(5) Remove the spigots from the clamps retaining the services to the strut.

R (6) Remove the wormdrive clips from the strut.

(7) Remove the bolts, washers and nuts from the clamp halves (Ref. Fig. 401)(Detail B) remove the free clamp halves and support all services clear of the strut.

(8) Remove the lower nut and bolt from the forward lower link of the fail safe rod; remove the fail safe and main engine mounting bolts complete with special washers and shims. Note the position for subsequent installation.

C. Remove Inboard/Outboard Thrust Strut Assembly

(1) Disconnect the bonding strip from the bonding lug, remove the special bolt, bonding lug, retaining washer and special nut from the forward attachment (Ref. Fig. 401)(Detail A).

(2) Remove the slotted nut, washers, bolt, pin retaining
R cap, shims and UV sensor mounting bracket assembly
R from the main engine mounting location
R (Ref. Fig. 401) (Detail C). Note the shim position

R for subsequent installation.

(3) Manually support the strut and remove the forward attachment pin, if necessary use the extractor tool E925153000. Remove the main engine mounting pin and remove the strut rearwards to clear the forward attachment.

NOTE: When using the extractor tool, ensure that the correct size spigot is used. A direct pull with no twisting action must be used during pin extraction.

D. Install Inboard/Outboard Thrust Strut Assembly

(1) Ensure that the thrust strut assembly, link assembly, attachment pins, mounting bracket assembly and pin retaining cap are undamaged.

(2) Position the strut to align with the forward and main engine mounting attachment locations, insert the attachment pins in their respective positions.

(3) Position the special nut and fit the special bolt, bonding lug and retaining washer (Ref. Fig. 401)
R Detail A. Torque-tighten the bolt to between 250 and
R 270 lbf in (2.82 and 3.05 mdaN) and wire-lock the bolt.

(4) Reconnect the bonding strip to the bonding lug (Ref. 20-27-12).

R (5) Position the UV sensor mounting bracket assembly, fit
R the shims and position the pin retaining cap at the
R main engine mounting location and retain them with the
R bolt, washers and slotted nut (Ref. Fig. 401) Detail
R C. Torque-tighten the slotted nut to between 160 and
R 180 lbf in (1.81 and 2.03 mdaN) and lock the nut with a split pin.

R (6) Ensure that the fail safe bolts, main engine mounting bolts, clamp halves and spigots are undamaged, check that the anchor nut on the mounting bracket assembly and the clamp halves are serviceable.

(7) Fit the shims and insert the main engine mounting bolts into their locations, fit the special washer and insert the fail safe bolts through the main engine mounting bolts.

(8) Align the fail safe forward lower link with the fail

safe bolt and secure with the shouldered bolt and nut. Torque-tighten the nut to between 40 and 50 lbf in (0.45 and 0.57 mdaN).

(9) Position the services and loosely assemble the clamp halves on the struts. Align the spigot holes in the clamps with the spigot holes in the strut. Screw the spigots into their respective locations.

NOTE: The spigot with the larger diameter plain shank mast be fitted at the rear clamp half position.

(10) Progressively tighten the retaining nuts and bolts on the forward clamp halves and maintain an equal gap on each side of the clamp. Torque-tighten the nuts and bolts to between 60 and 70 lbf in (0.68 and 0.79 mdaN). Check that the gap at each side of the clamp is not less than 0.020 in (0.508 mm).

NOTE: The clamp halves may be lined with up to three layers of Teflon pressure sensitive tape to achieve the necessary gap.

(11) Progressively tighten the retaining nuts and bolts on the rear clamp halves, no gap is permissible at the side of the clamp which retains the tray support bracket assembly. Torque-tighten the nuts and bolts to between 60 and 70 lbf in (0.68 and 0.79 mdaN). Check that the gap on the topside of the clamp is not less than 0.020 in (0.508 mm).

NOTE: After torque-tightening the rear clamp halves, if the gap at the upper side of the clamp is closed, but providing that the clamp is tight on the strut, no further action is necessary. If the clamp is loose on the strut the clamp halves may be lined, with up to three layers of Teflon sensitive tape to ensure that the clamps are tight on the strut.

(12) Torque-tighten the spigots to between 80 and 90 lbf in (0.90 and 0.102 mdaN) and wire-lock the spigots.

(13) Position the cable runs of the strut and retain them with the wormdrive clips. Hand tighten the clips to retain the cables and wire-lock.

(14) Position the steady link bracket at its location and temporarily retain it with the two ultra violet sensor upper retaining bolts; secure the bracket with the

R nut, washer and bolt. Torque-tighten the nut to
R between 30 and 40 lbf in (0.34 and 0.45 mdaN). Remove
R the temporary bolts.

(15) Install the secondary heatshields (Ref. 71-22-13, Removal/Installation).

(16) Install the primary heat exchanger (Ref. 21-12-11, Removal/Installation).

(18) Install the engine (Ref. 71-00-12, Removal/Installation).

ENGINE MOUNTING LINK ASSEMBLIES - REMOVAL/INSTALLATION

1. General (Ref. Fig. 401)

The link assemblies form part of the engine mounting. The upper attachment is protected from the engine bay environment by secondary heatshields.

2. Link Assemblies (Centrewall)

A. Equipment and Materials

DESCRIPTION	PART NO.
Rocol AS powder (Ref. 20-30-00, No.65)	-
Torque adapter	14701NSA5063/18
Extractor	65601NSA5064/18
Insertion tool	65602NSA5064/18
Torque spanner 0 to 2,400 lbf in 0 to 27 mdaN) range	-

B. Prepare

(1) Remove the appropriate thrust strut assembly (Ref. 71-21-13, Removal/Installation).

(2) Remove the necessary secondary heatshields to gain access to the link assembly upper attachment location (Ref. 71-32-13, Removal/Installation).

C. Remove.

NOTE: A helical groove for attaching an extractor, is cut on the shoulder of the lockwasher.

Care should be taken to prevent damage to the outer fitting during the removal of the spring lock washer and special nut.

(1) Screw the extractor on to the spring lock washer; remove and discard the washer.

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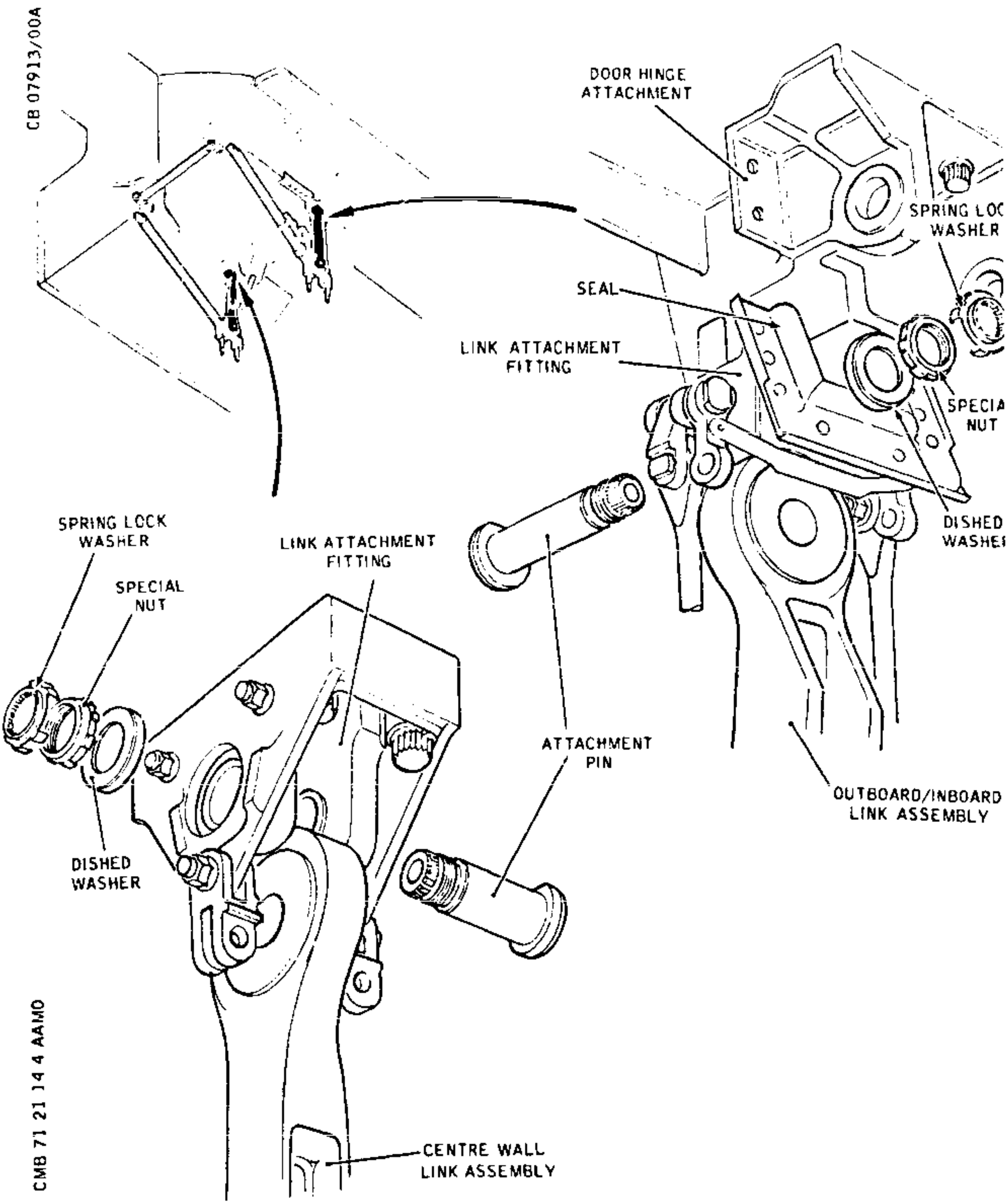


Link Assembly Upper Attachments
Figure 401

R

R (2) Remove the special nut using the torque adapter
R and remove the dished washer.

(3) Support the link assembly and remove the attachment pin, disengage and remove the link assembly from the attachment fitting complete with the spherical bearing.

D. Install

(1) Ensure that the link assembly is undamaged and that the spherical bearing housing is clean.

(2) Ensure that the spherical bearing is clean, and undamaged and fit it into its housing. Ensure that the bearing is free to rotate in its housing.

(3) Ensure that the attachment fittings are secure and undamaged.

(4) Ensure that the attachment pin, dished washer and special nut are serviceable.

(5) Position the link assembly, so that the spherical bearing bore aligns with the attachment fitting holes.

(6) Lightly lubricate the bearing portion of the attachment pin with AS. powder and insert it into its location.

(7) Ensure that the flat on the attachment pin head locates on the lug of the attachment fitting.

(8) Secure the attachment pin with the dished washer and special nut.

(9) Torque load the special nut to between 1,947 and 2,301
R lbf in (22 and 26 mdaN) using the torque adapter and
R lock the nut with a new spring lock washer using the
R insertion tool.

(10) Install the secondary heatshields removed to gain access to the link attachment (Ref. 71-32-13, Removal /Installation).

(11) Install the thrust strut assembly (Ref.71-21-13, Removal/Installation).

3. Link assemblies (Outboard/Inboard)

A. Equipment and Materials

DESCRIPTION	PART NO.
Rocol AS powder (Ref. 20-30-00, No.65)	-
R Torque adapter	14701NSA5063/18
R Extractor	65601NSA5064/18
R Insertion tool	65602NSA5064/18
Torque spanner 0-1,400 lbf in (0-16 mdaN)	-

B. Prepare

(1) Remove both the engine bay doors (Ref. 54-32-11 and 54-32-12, Removal/Installation).

(2) Remove the appropriate thrust strut assembly (Ref. 71-21-13, Removal/Installation).

(3) Remove the necessary secondary heatshields to gain access to the link assembly upper attachment location (Ref. 71-32-13, Removal/Installation).

C. Remove

NOTE: A helical groove, for attaching an extractor, is cut on the shoulder of the lock washer.

Care should be taken to prevent damage to the seal during the removal of the spring lock washer and special nut.

(1) Screw the extractor on to the spring lock washer; remove and discard the washer.

R (2) Remove the special nut using the torque adapter
R and remove the dished washer.

(3) Support the link assembly and remove the attachment pin, disengage and remove the link assembly from the attachment fitting complete with the spherical bearing.

D. Install

(1) Ensure that the link assembly is undamaged and the

spherical bearing housing is clean.

(2) Ensure that the spherical bearing is clean and undamaged and fit it into its housing; ensure that the bearing is free to rotate in its housing.

(3) Ensure that the attachment fitting is secure and undamaged.

(4) Ensure that the attachment pin, dished washer and special nuts are serviceable.

(5) Lightly lubricate the bearing portion of the attachment pin with the AS. powder and insert it into its location.

(6) Ensure that the flat on the attachment pin head locates on the lug of the attachment fitting.

(7) Secure the pin with the dished washer and special nut.

(8) Torque load the special nut to between 1,150 and
R 1,327.5 lbf in (13 and 15 mdaN) using the torque
R adapter. Lock the nut with a new spring lock
R washer using the insertion tool.

(9) Install the secondary heatshields removed to gain access to the link attachment (Ref. 71-32-13, Removal/Installation).

(10) Install the thrust strut assembly (Ref. 71-21-13, Removal/Installation).

(11) Install the engine bay doors (Ref. 54-32-11 and 54-32-12, Removal/Installation).

FIRESEALS - DESCRIPTION AND OPERATION

1. General

Fireseals comprise all those items, static or moveable, which isolate an engine bay to contain a fire or to reduce heat transfer. These include firewalls and heatshields which are constructed of fire resistant material to protect the undersurface of the wing and sides of the engine bay and engine services. For details of the engine bay fireproof bulkheads, centrewall or doors refer to 54-00-00. Also included under the heading of fireseals are fireflaps.

2. Firewalls and Heatshields

The wing bottom surface firewall forms the roof of the engine bays. It is made up of a number of removeable panels manufactured from fire resistant material (Ref. 71-32-00).

Secondary heatshields are fitted where services, for example fuel pipes or electrical cables, enter the engine bays from the wing and also to enclose joints in the centre and side walls. Heatshields are also fitted to reduce heat transfer from the hot end of the engine to the surrounding structure (Ref. 71-32-01).

The exhaust assembly or twin secondary nozzle and attachments have extensive heatshields for protection against engine exhaust temperatures.

3. Fireflaps

The fireflaps system closes secondary air doors and a ventilation flap in each engine bay before a fire extinguisher switch is pressed (Ref. 71-31-00). The system is operated from four engine shut-down handles on the pilots roof panel, one for each engine bay, and indicated by a single fireflaps caption in the centre of the panel. Other services are isolated by the engine shut-down handle (Ref. 26-22-00).

The secondary air doors in the forward fireproof bulkhead of each engine bay open in flight to allow ventilating air, bled from the intake ramp void, into the engine bay. The doors are driven by a flexible drive from an electric motor and controlled from switches on the power management panel at the 3 CM's position. The doors are closed on the ground and in flight are subject to the overriding control of the engine shut-down handle.

The engine bay ventilation flap in each engine bay forward door admits ventilating air into the engine bay when the

aircraft is on the ground or in low speed flight. The flap is biased open and operates aerodynamically, but when an engine
R shut-down handle is pulled the flap is actuated closed.

FIREFLAPS (SECONDARY AIR DOORS AND ENGINE BAY VENTILATION FLAP) - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001, 002 and 003)

The fireflaps comprise two systems of flaps controlling air flow around the engine, which are linked, for emergency operation, to the engine shut down handles on the pilots roof panel (Ref. 26-22-00).

When actuated, the circuit overrides and shuts the secondary air doors, which are a complete sub system in themselves and which control the supply of ventilating air to the engine bays in flight. It also closes the engine bay ventilation (ground running) flaps which admit air into the engine bays on the ground and in low speed flight.

The secondary air doors are located in the forward fireproof bulkhead of each engine bay and, when not isolated by the shut-down handle, are controlled electrically from switches at the 3CM station. Each engine bay system consists of four secondary air doors, a flexible drive, an electric motor, four screwjacks and an indication switch unit. It also includes a three position control switch, a magnetic indicator at the 3CM station , and the circuit relays and wiring. Electrical power and switching supplies are from the 115V a.c. and 28V d.c. essential busbars respectively.

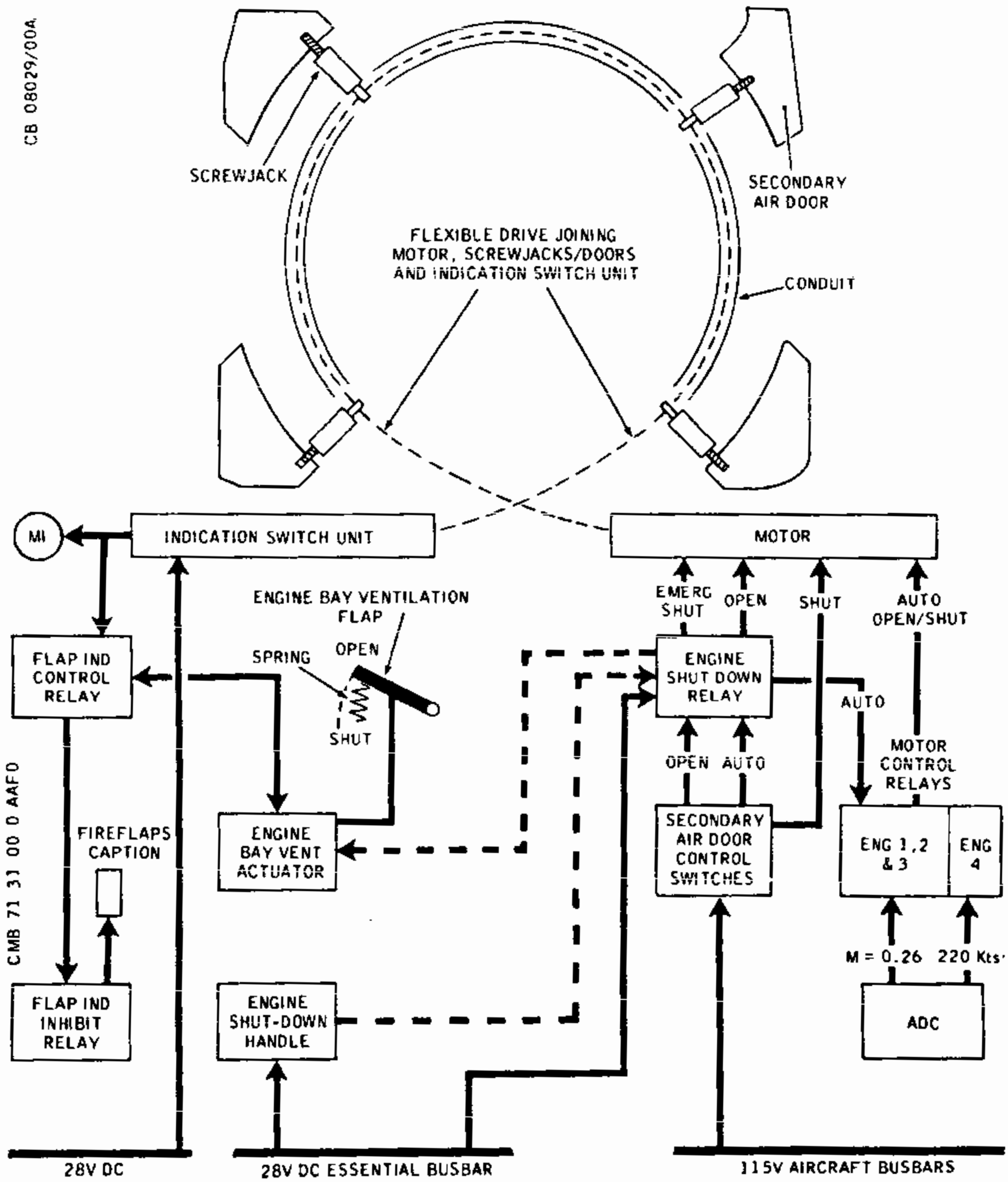
The secondary air door system can be controlled by one of three means:

Manual - by operation of 3-position switch at the 3CM station to OPEN or SHUT.

R Auto - by operation of the 3-position switch to AUTO
R when the doors are automatically opened on take-off
R by an air data computer (ADC) speed signal. On
R landing, the secondary air doors for engines 1,2 and
R 3 are closed by an ADC speed signal coupled with a
R landing gear weight switch relay signal,and for engine
R 4 by an ADC speed signal coupled with a landing gear
R down-lock relay signal.

Emergency - when the engine shut-down handle is pulled and the doors are closed irrespective of switch selection at the 3CM station.

The engine bay ventilation flaps, one in each engine bay forward door, are spring biased open until a positive air pressure in the engine bay closes them. They start to close at an aircraft forward speed of M 0.3, just after the secondary air doors are opened. Each flap is also controlled by an electrical actuator which closes the flap when the associated engine shut-down handle is pulled (Ref. 26-22-00, Description and Operation).



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Fireflaps Block Diagram
Figure 001

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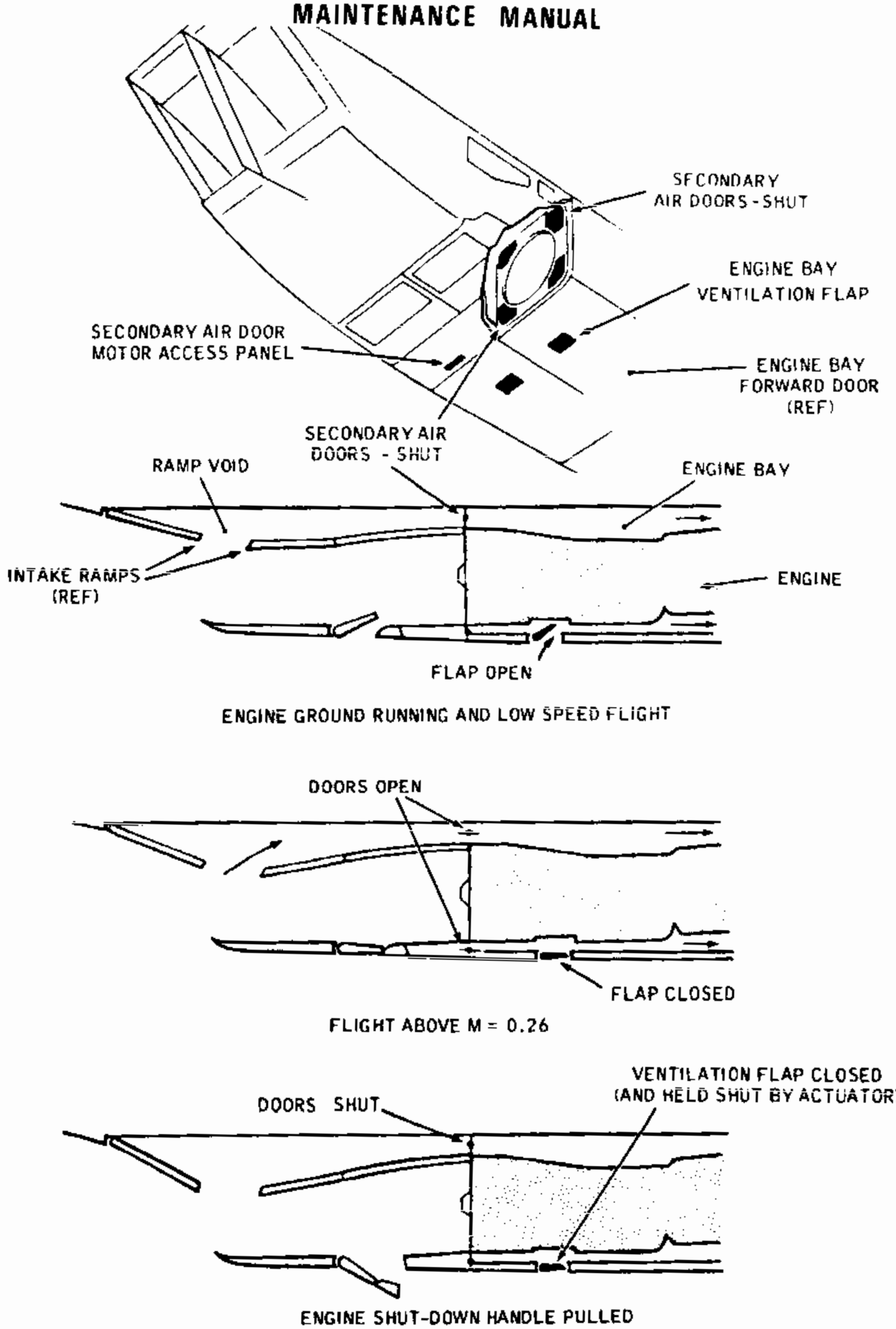

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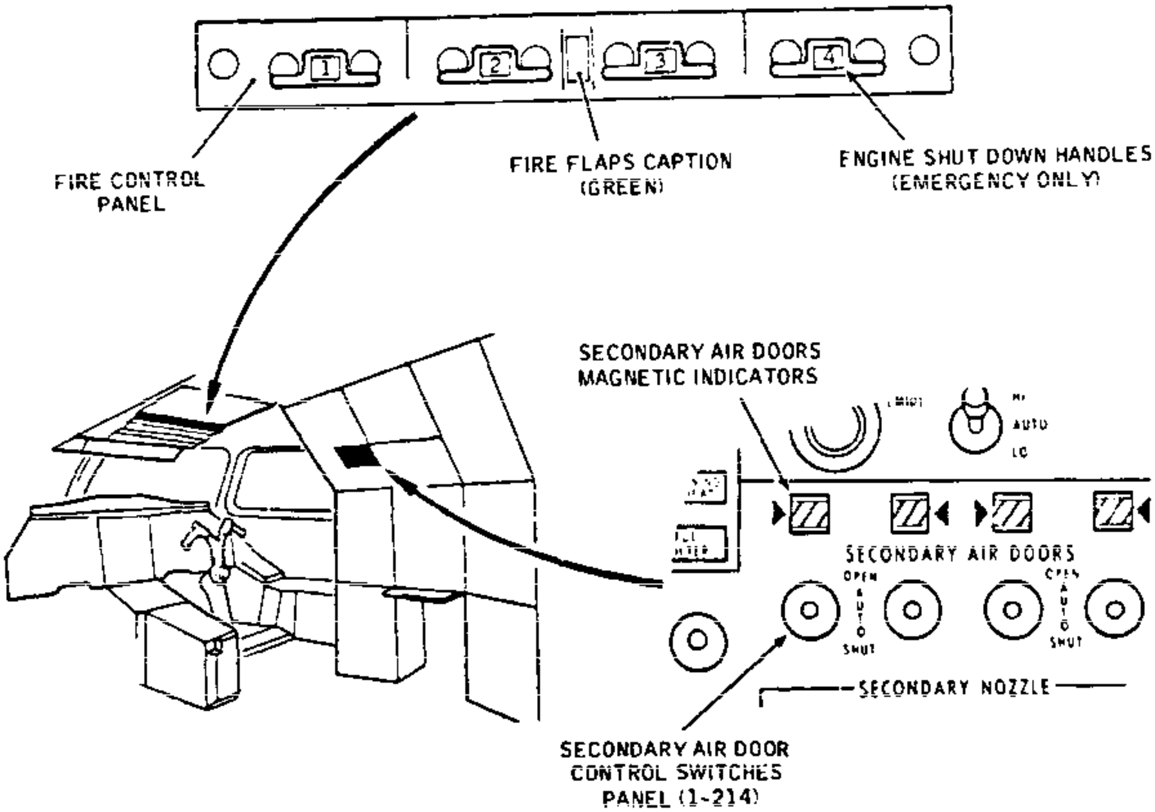
Engine Bay Ventilating Air Control
Figure 002



Fireflaps - Control
Figure 003

When the secondary air doors and the engine bay ventilation flap on a particular engine are shut by pulling the emergency shut-down handle, a green FIRE FLAPS caption illuminates on the pilots' roof panel. This is an essential pre-requisite to pressing a fire button. The control relays and diodes for engine shut-down, secondary air door, flap indication and flap indication inhibit are all located in the equipment bays below the floor immediately aft of the 3CM position in racks 11-123, 19-123, 20-123.

2. Motor - Secondary Air Door (Ref. Fig. 004)
A three-phase induction motor, incorporating an automatic brake, is located in each intake bolted to the structure above an access panel in the bottom skin. The motor engages with the flexible drive at one side and has a receptacle for an electrical connection. The motor turns a designed number of revolutions between internal limit switches and when removed from the aircraft is always to be left in the 'shut' datum position. A new motor will always be received in the 'shut' datum position.

The motor operates from a 200V three-phase 400 Hz a.c. supply and has a rating of one minute. It is not to be operated more than one cycle in a period of two minutes.

R The diagram (Ref. Fig. 004) shows that the nominal travel
R for the motor is 520 revolutions between limit switch
R operating points. At the end of the travel there is a small
R amount of over-run after the motor is switched off before the
R brake stops the travel. The over-run varies between 10 and
R 20 revolutions depending on the efficiency of the brake and
R gives a maximum travel for the motor of 560 revolutions from
R the shut datum position to the 'fully open' position.

R The operating point for each of the control limit switches is
R considered as the point at which the switch operates when the
R motor is travelling towards the end of travel where that limit
R switch cuts out the supply. Because of switch hysterisis the
R same switch will operate at a different point if the motor is
R travelling in the other direction. It is essential to
R remember this point when checking motor travel between the
R control limit switches.

3. Flexible Drive Shafts - Secondary Air Doors (Ref. Fig. 004)

Flexible drive shafts join the motor to the screwjacks and the screwjacks to each other, and form a continous circular drive which terminates at the indication switch unit. There are five separate flexible drive shafts. Each drive has a wire wound steel core with squared steel ends and a flexible outercasing with end ferrules and end nuts. The bottom two shafts, which are short, join the motor to a screw-jack and a screwjack to the indicating switch unit respectively. The other three drives are located by plastic bobbins in conduits mounted on the forward face of the fire-proof bulkhead. In addition a number of C-clips support portions of the side drives external to the conduits.

The drive shafts are accessible from the engine bay with the secondary air doors open or removed, and through the motor access panel.

4. Screwjacks - Secondary Air Doors (Ref. Fig. 004)

The screwjacks open and close the secondary air doors. Each screwjack is secured between a nacelle bracket on the intake structure and a door bracket. When the screwjacks are extended the doors are open. A screwjack travels 1.898 in plus or minus 0.012 in (48.26 mm plus or minus 0.301 mm) between retract and extend stops.

For access purposes, on most of the doors, the adjustable end

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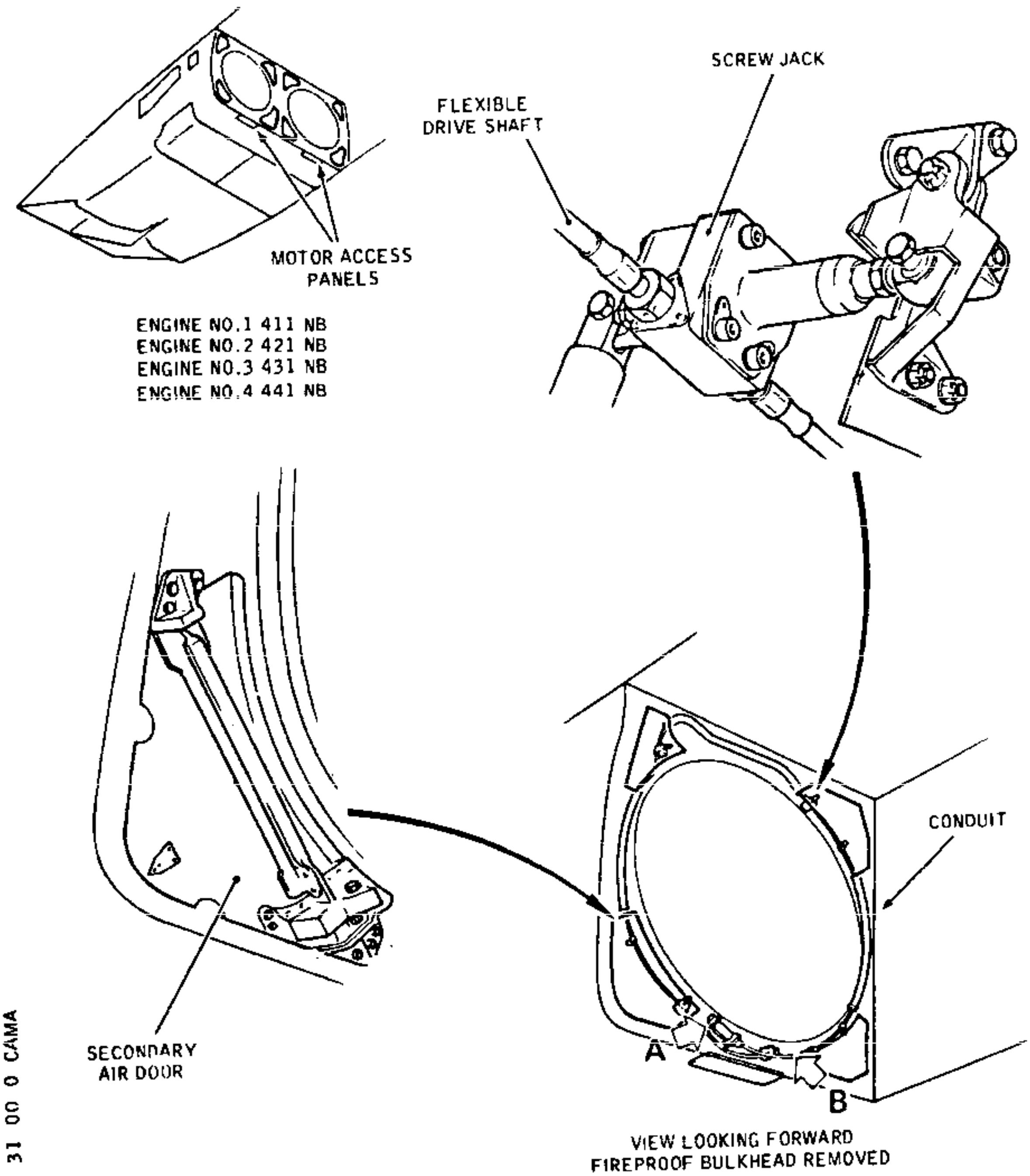

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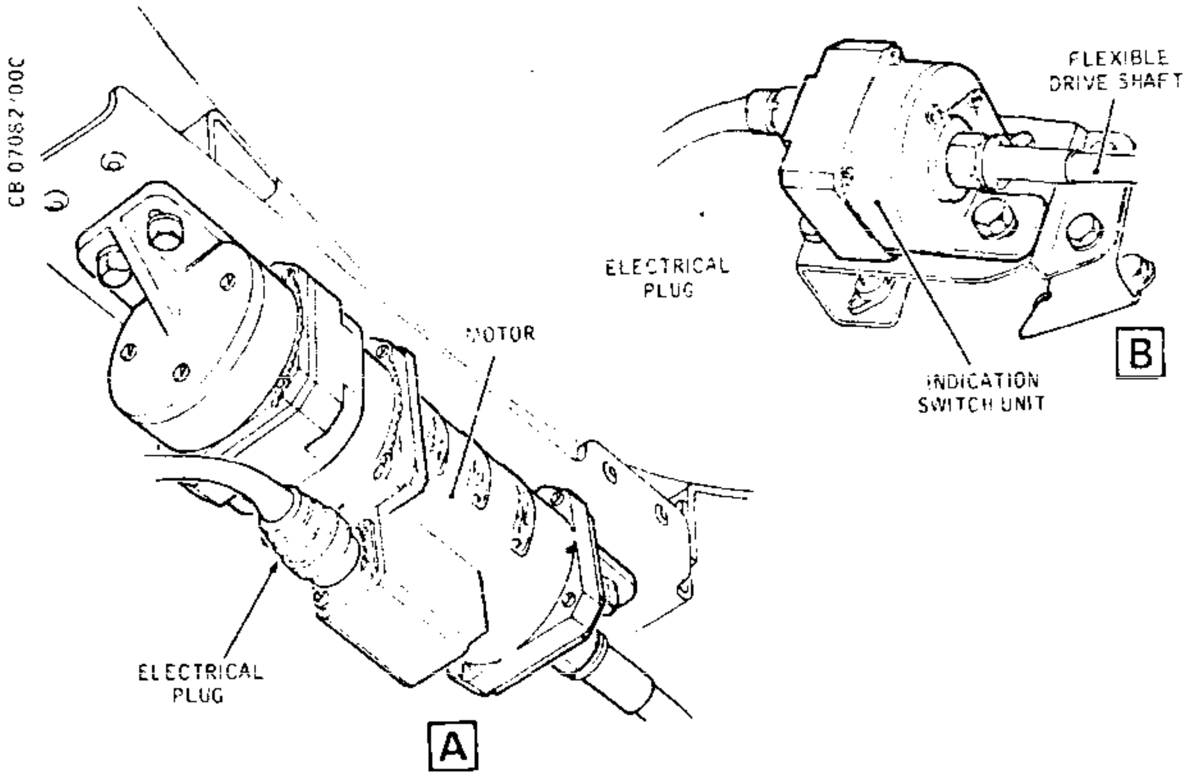
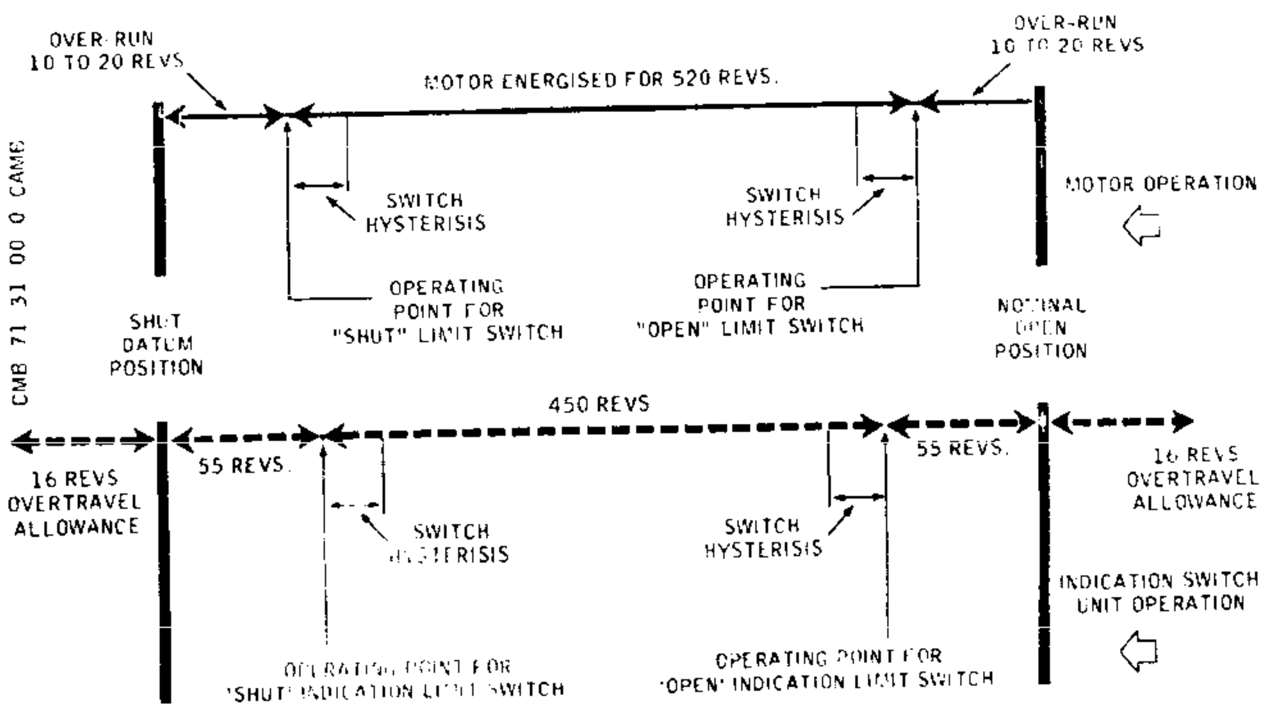
Secondary Air Doors (Sheet 1 of 2)
Figure 004





Secondary Air Doors (Sheet 2 of 2)
R Figure 004

of the screwjack protrudes through a slot in the door hinge bracket and the bolt is inserted from the rear face of the door. In the case of the top outer doors in each nacelle, the screwjack is secured to a lug bolted to the front face of the door. This arrangement permits the actuating mechanism, which is mounted in front and forward of the area to be isolated in case of fire, to be accessible from the rear with the doors either open or removed.

The jacks, which are driven by the flexible drive shafts are handed, the handing being determined by the angle of the fixed end of the screwjack. The screwjack operating shaft is adjustable. A coarse adjustment is obtained by screwing the eye-end of the screwjack into or out of the operating shaft. A fine adjustment is obtained by turning a key inserted in one of the drive sockets of the jack. A new screwjack will be received set to the fully retracted stop.

5. <u>Indication Switch Unit - Secondary Air Doors</u> (Ref. Fig. 003)

An indication switch unit is bolted to the intake structure above each motor access panel. The switch accommodates the square end of the flexible drive and provides a receptacle for an electrical connection. The switch body also has a window from which the datum SHUT position of the switch may be determined for maintenance purposes. The switch provides a signal to the magnetic indicator at the 3CM position.

The diagram (Ref. Fig. 004) shows that the indication switch unit has a travel of 450 revolutions between the operating points of the two indication limit switches. To arrive at the unit shut datum position it is necessary to wind the input shaft a further 55 revolutions in the closed direction from the point at which the 'SHUT' indication limit switch operates. If the input shaft is wound towards the 'OPEN' position there will be a further 55 revolutions after the open limit switch has operated before the unit reaches the fully open position (560 revolutions from the shut datum position). In addition, the unit is so designed that when installed in this condition there will be a minimum of 16 revolutions overtravel at each end of the 560 revolutions system travel, that is, a minimum of 592 revolutions total travel. This overtravel is to prevent the operating arm over-running the extent of the limit switch travel.

A new switch will always be received in the shut datum position.

6. <u>Secondary Air Doors</u> (Ref. Fig. 004)

The secondary air doors when open permit secondary air from the ramp void to enter the engine bay. When closed they form a fireproof seal with the fireproof bulkhead.

The doors are hinged on brackets secured to the rear face of the fireproof bulkhead (Ref.54-21-00). The upper door nearest the sidewall has a screwjack attachment lug bolted to its forward face. The other doors each have a slot through which the screwjack shaft protrudes to bolt to the hinge bracket. The doors close on door sealing strips riveted to the bulkhead. The doors are attached to the hinge brackets by a hinge bolt and spigot. To remove a door, it is only necessary to remove the hinge bracket bolts and the door and bracket assembly can be removed from the spigot.

7. Engine Bay Ventilation Flap (Ref. Fig. 005)

The engine bay ventilation flap is an inward opening flap hinged to brackets secured to the engine bay forward lower door (Ref.54-31-00).

A thrust lever to which the actuator ram is secured pivots about the flap hinge point. The lever has a thrust pad which bears on the inner surface of the ventilation flap and constitutes the open stop. A coil wound spring is secured between the thrust lever and one of the vent flap brackets to bias the flap open. The flap closes onto a landing on the forward door structure. The actual sealing being achieved by means of a P-seal and retainer strip secured to the outer edge of the flap by screw pins.

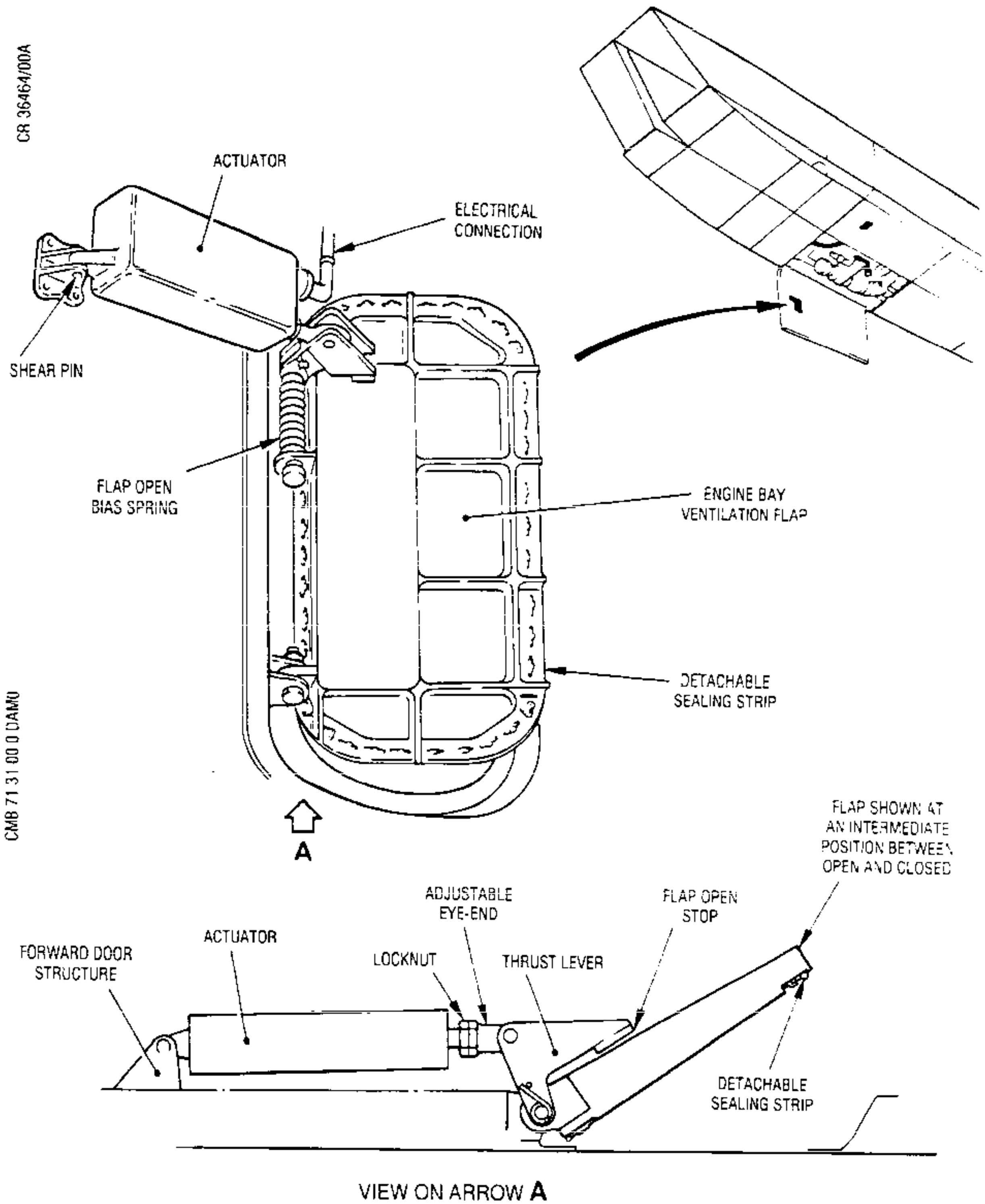
8. Engine Bay Ventilation Flap Actuator (Ref. Fig. 005)

This is a 28V d.c. linear actuator with internal limit switches and an automatic mechanical brake. It has a nominal stroke of one inch from a ram which terminates in an adjustable eye-end. The actuator is bolted to a thrust lever at one end and secured by a shear pin to a door bracket at the other. It has a receptacle for the electrical connection at the end nearest the ventilation flap.

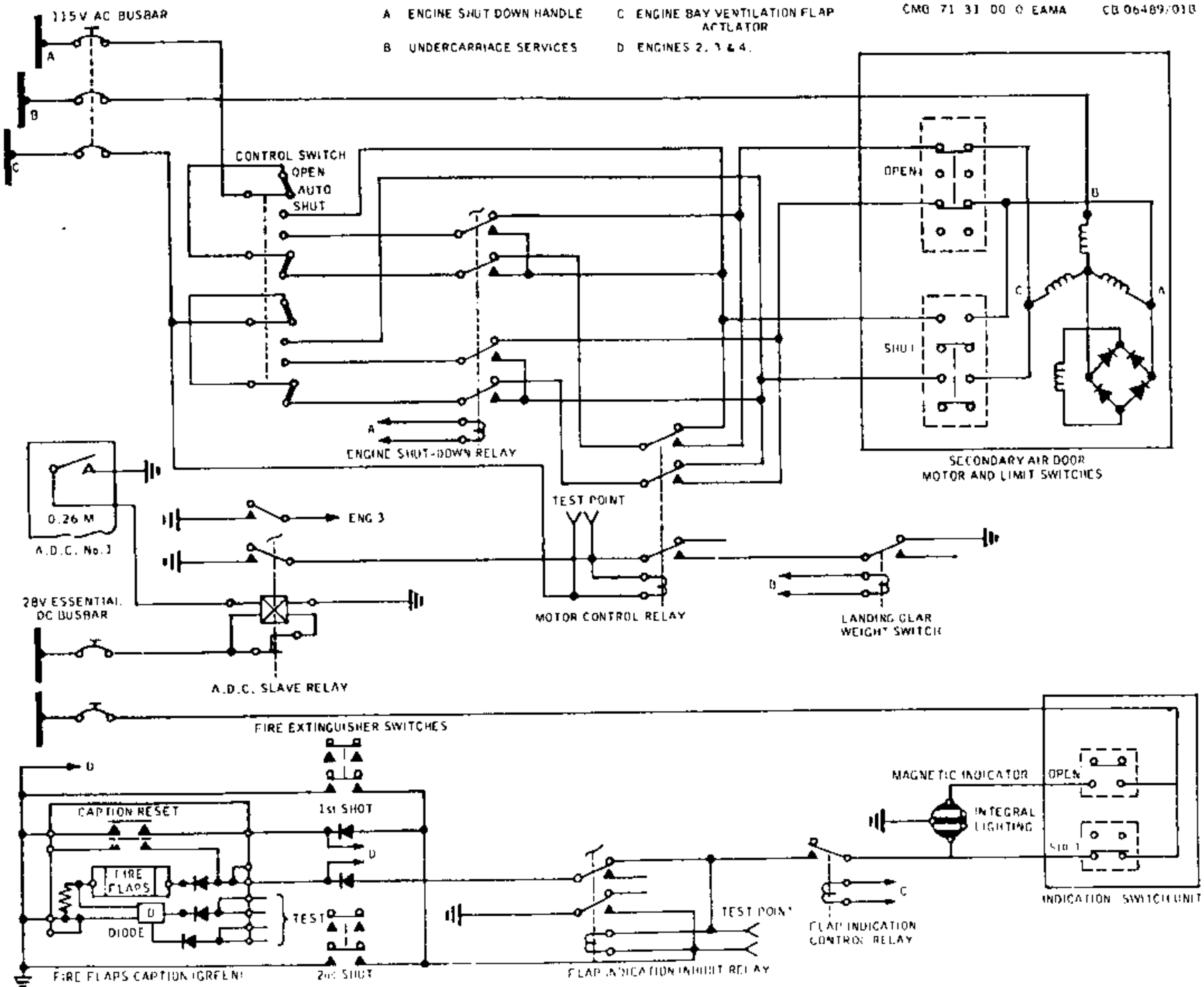
When an engine shut-down handle is pulled the associated actuator extends and the thrust lever forces the flap closed and holds it shut. The actuator is not to be run more than once in a period of two minutes.

9. Operation (Ref. Fig. 006, 007 and 008)

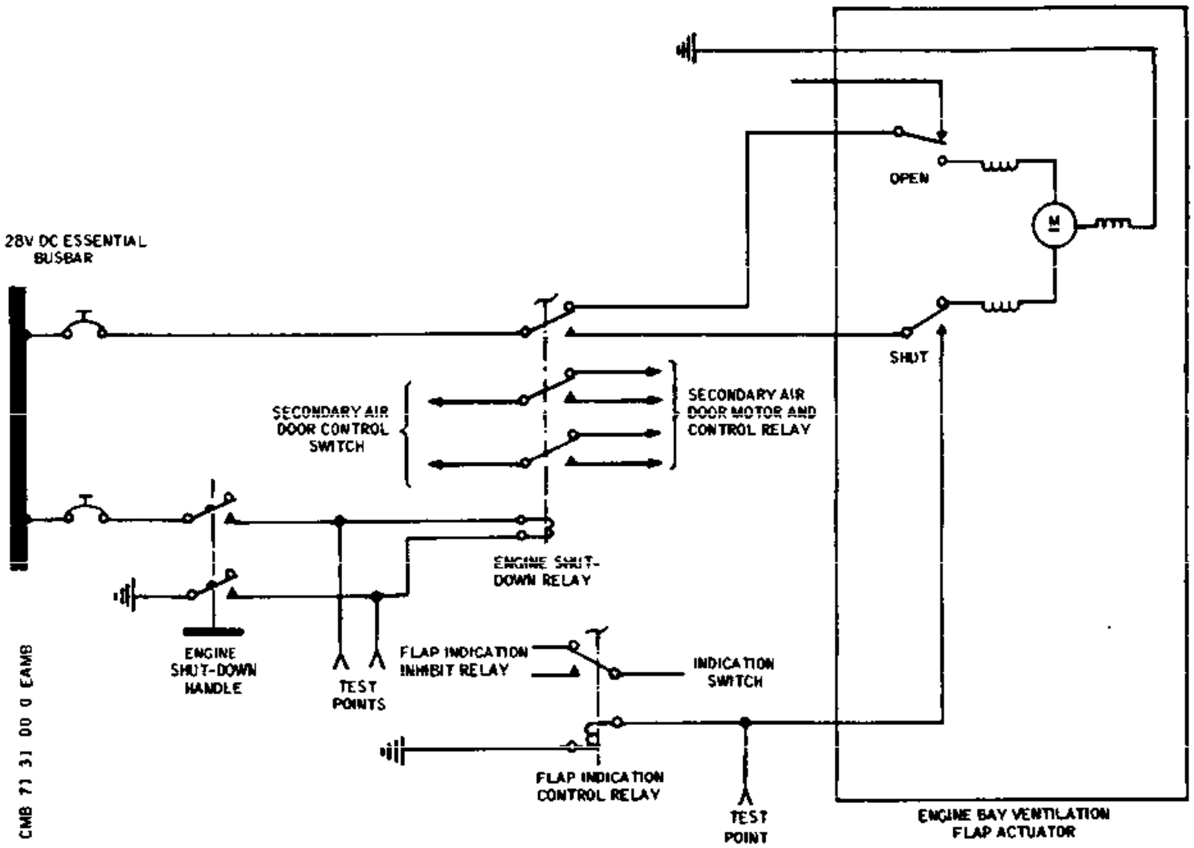
There are two distinct operational sequences in the fire-flaps system:



Engine Bay Ventilation Flap and Actuator
Figure 005



Fireflaps engines 2 and 3 - Simplified Circuit
(Sheet 1 of 2)
Figure 006



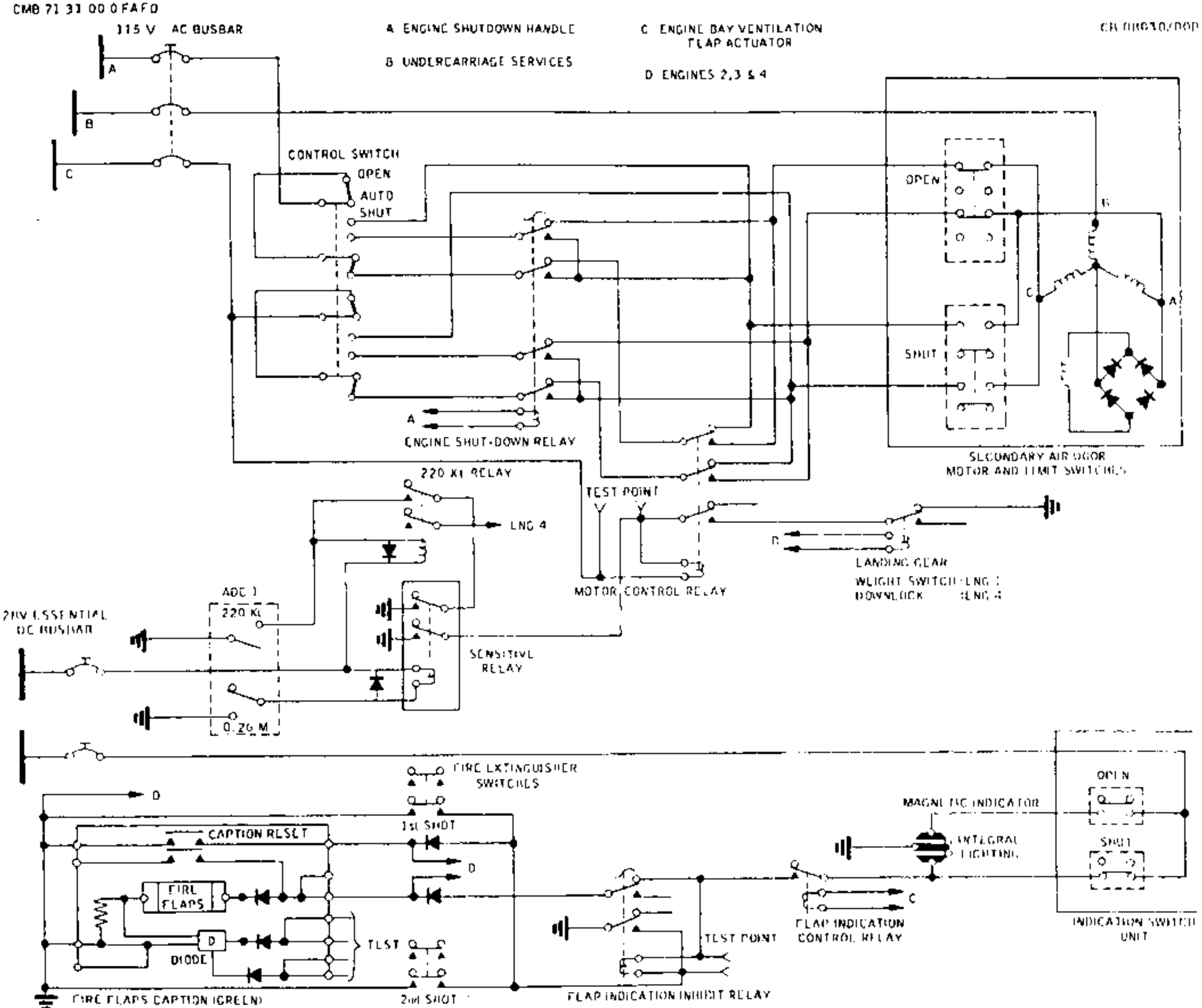
Fireflaps - Simplified Circuit (Sheet 2 of 2)
Figure 006

A. The normal operation of the secondary air doors and engine bay ventilation flap.

B. The sequence of operation initiated by pulling an engine shut-down handle.

The following operations are typical for any of the four engines. The secondary air door control switch has three positions, OPEN-AUTO-SHUT, and is toggle-locked in each position. The switch in conjunction with the engine shut-down relay, the secondary air door motor control relay and the motor limit switches, controls two supply phases to the motor, the third phase being connected directly to the motor.

Normally the two control phases are switched from open to shut and shut to open by the secondary air door motor control relay and motor limit switches with the control switch in the AUTO position. In certain conditions the switching is achieved by the engine shut-down control relay.



Fireflaps engines 1 and 4 - Simplified Circuit
Figure 007

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A. Secondary Air Doors and Vent Flaps - Normal Operation

With the secondary air door control switch at OPEN the two controlphases are connected to the motor by the de-energized engine shut-down relay and the open limit switches of the motor, thus driving the motor and secondary air doors to the open position.

R In AUTO, the supply phase is controlled by an ADC speed
R switch during take-off and the same ADC speed switch and an
R landing gear switch during landing. During take-off, the
R secondary air door control relay is de-energised and the
R doors remain shut. At M 0.26 for engines 1, 2 and 3 and
R 220 kt for engine 4, the ADC speed switches signal the
R secondary air door control relays to energise and open the
R doors. During landing, the landing gear switches and the
R ADC speed switches cause the doors to close when the speed
R is below M 0.26 and weight is on the landing gear (engines)
R 1, 2 and 3) and with speed below 220 kt with landing gear
R locked down (engine 4).

In SHUT the supply phases are connected directly to the shut limit switches of the secondary air door motor which is driven to the shut position.

NOTE: Any one position of the secondary air door control switch electrically overrides the other two positions.

B. Engine Shut-Down Handle - Operation

When an engine shut-down handle is pulled, the action energizes the engine shut-down relay and causes:

(1) The two supply phases to the secondary air door motor to be switched to the shut limit contacts; the motor and secondary air doors close.

(2) The supply to the engine bay ventliation flap actuator to be switched to the shut limit contacts and the actuator and flap close.

(3) The shut engine bay ventilation flap and secondary air doors energize the flap indication control relay and illuminate the green FIRE FLAPS caption.

NOTE: 1. When the fire button or the caption is pressed the flap indication inhibit relay is energized and the caption will go out.

2. The engine shut-down handle has to be reset

after use (Ref. Adjustment/Test).

10. System Management (Ref. Fig. 008)

The fire flaps system enables the supply of engine bay ventilating air to be controlled during normal operations and cut-off during an emergency. Switches and MI's on the power management panel enable the secondary air doors to be operated for servicing purposes. In addition engine shut-down handles and a fireflaps caption on the pilots' roof panel may be used to test the complete fireflaps system; provided the other circuits operated by the handle are first made safe. To carry out these procedures electrical ground power must be connected to the aircraft.

A test set is used for functional testing of the secondary air door system and more detailed servicing tasks. The set requires a separate electrical power source.

11. Electrical Power Supplies

The electrical power supplies for the fireflaps system are detailed in Table 1.

SERVICE	BUSBAR	C/B PANEL
Engine No.1		
Bay Cooling Flap Cont. and Ind.	'A' essential 28V d.c. 4p	3-213
Shut-Down Cont.	'B' essential 28V d.c. 4p	3-213
Sec.air Door Mtr. Sup	No.1 essential 115V a.c. 5p	2-213
Sec.air Door Posn. Ind	'A' essential 28V d.c. 3p	1-213
Engine No.2		
Bay Cooling Flap Cont. and Ind	'A' essential 28V d.c. 3p	1-213
Shut-Down Cont.	'A' essential 28V d.c. 3p	1-213
Sec.air Door Mtr. Sup	No.2 essential 115V a.c. 6p	2-213
Sec.air Door Posn. Ind	'B' essential 28V d.c. 4p	5-213
Engine No.3		
Bay Cooling Flap		

SERVICE	BUSBAR	C/B PANEL
Cont. and Ind	'A' essential 28V d.c. 3p	1-213
Shut-Down Cont.	'A' essential 28V d.c. 3p	1-213
Sec.air Door Mtr. Sup	No.3 essential 115V a.c. 7p	4-213
Sec.air Door Posn. Ind	'B' essential 28V d.c. 4p	5-213
Engine No.4		
Bay Cooling Flap Cont. and Ind	'B' essential 28V d.c. 4p	3-213
Shut-Down Cont.	'B' essential 28V d.c. 4p	3-213
Sec.air Door Mtr. Sup	No.4 essential 115V a.c. 8x	4-213
Sec.air Door Posn. Ind	'A' essential 28V d.c. 3p	1-213

Electrical Supplies
Table 1

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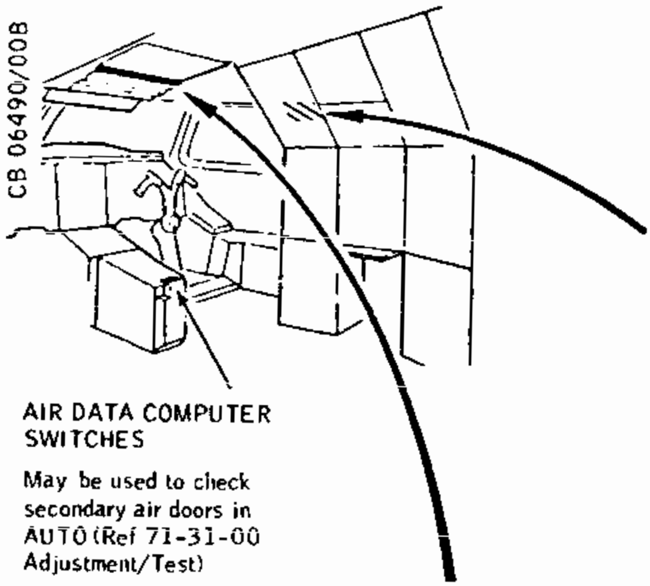
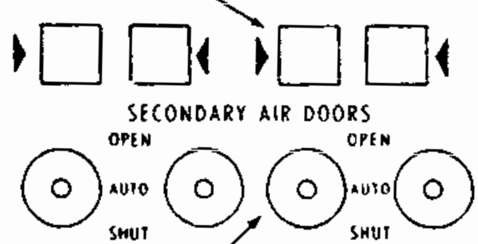


SECONDARY AIR DOOR M.I.

Indicates the position of the secondary air doors. Diagonal lines indicate doors in transit or failure of electrical power supplies.



AIR DATA COMPUTER SWITCHES

May be used to check secondary air doors in AUTO (Ref 71-31-00 Adjustment/Test)

SECONDARY AIR DOOR CONTROL SWITCH

OPEN - A locked toggle switch used to open the doors on the ground.

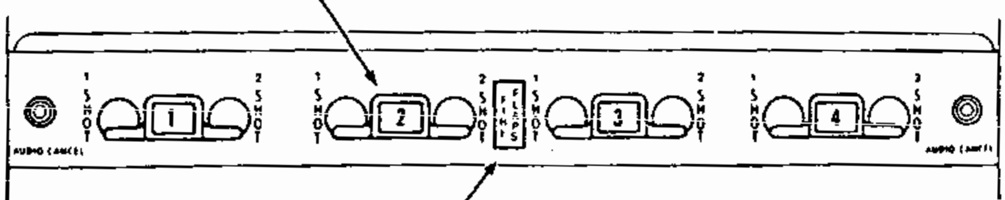
AUTO } Used for system tests only.
SHUT } With power supplies connected to the aircraft the secondary air doors will close as soon as the control switch is moved from OPEN by a signal from the air data computer.

CAUTION: TO AVOID DAMAGE TO THE MOTOR, DO NOT OPERATE MORE THAN ONE CYCLE IN A PERIOD OF 2 MINUTES.

ENGINE SHUT-DOWN HANDLE (Emergency only)

Pull handle to operate the fire flaps.
CAUTION: THE OTHER SYSTEMS OPERATED BY THE HANDLE MUST FIRST BE MADE SAFE. (Ref.26-22-00).

Manually reset the handle after use.



FIRE FLAPS CAPTION (Green)

ILLUMINATED - Indicates that the secondary air doors and engine bay vent flap are closed. Press to cancel caption light.

CMB 71 31 00 0 FAMO

System Management
Figure 008

R FIRE FLAPS (SECONDARY AIR DOORS AND ENGINE BAY VENTILATION FLAP)
R - SERVICING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

This topic describes the procedure to be adopted when it is necessary to open the secondary air doors, on the ground, for servicing purposes.
The servicing is described for No.1 engine and may be repeated in a similar manner for the other engines.

2. Secondary Air Doors - Operation (Ref. Fig. 301)

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque limiting screwdriver range: 25-30 lbf in (0.29-0.34 mdaN)	-
Circuit breaker safety clips	-

B. Prepare to Open

WARNING: ENSURE THAT THE AREA AROUND THE SECONDARY AIR DOORS IS CLEAR OF PERSONNEL AND EQUIPMENT.

(1) Ensure that the No.1 engine shut-down handle (emergency only) is in position.

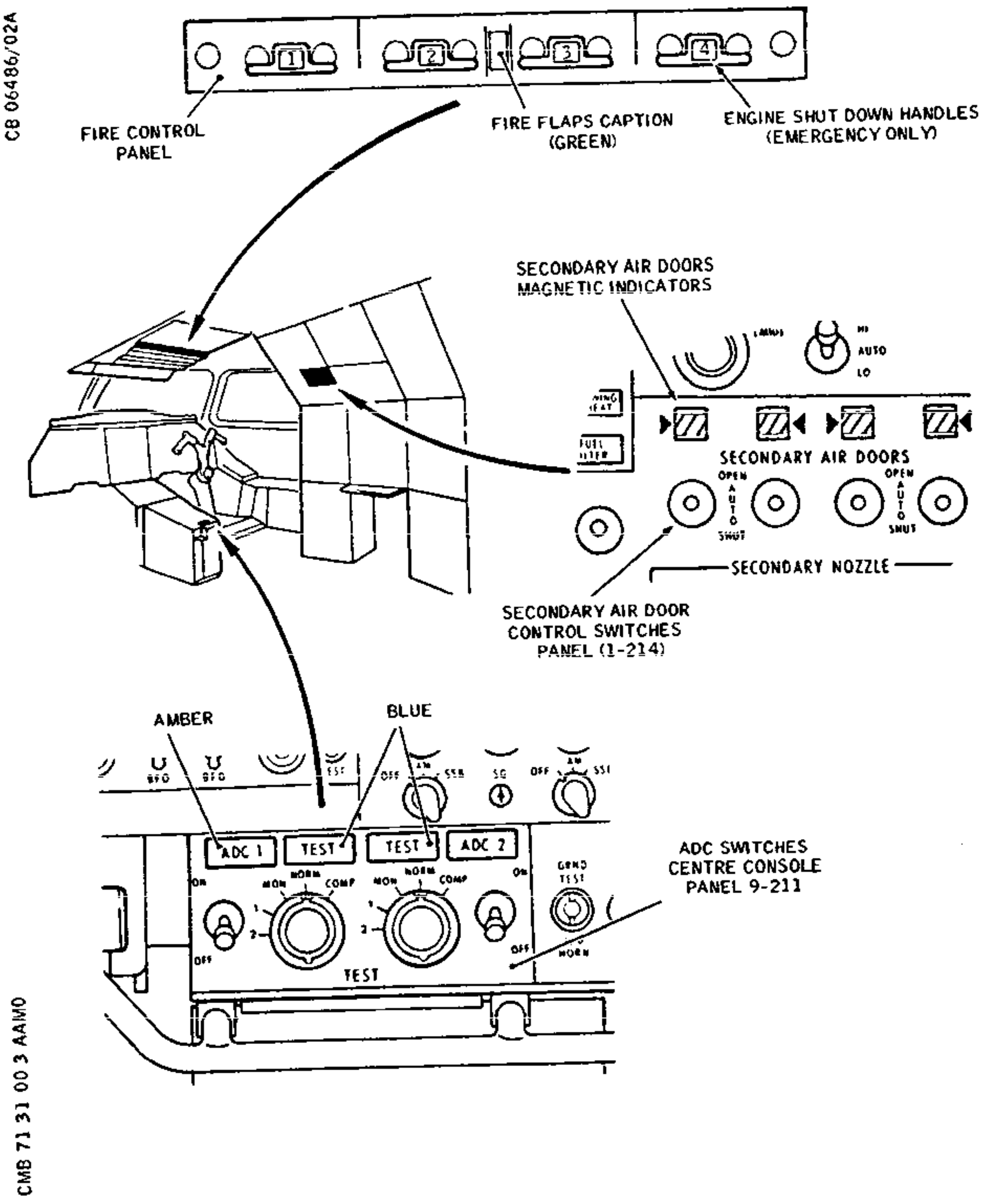
R (2) Ensure that the ADC rotary test switches on panel
R 9-211 centre console are at NORMAL.

(3) Make available electrical ground power. (Ref. 24-41-00, Servicing).

C. Open

CAUTION: DO NOT OPERATE THE DOORS MORE THAN ONE CYCLE OF OPERATION IN TWO MINUTES.

(1) Set the No.1 SECONDARY AIR DOORS control switch in the 3CM position to "OPEN", and check that the



Secondary Air Doors - Control
Figure 301

Printed in England

magnetic indicator (MI) shows OPEN.

(2) Switch off and disconnect electrical ground power (Ref. 24-41-00, Servicing).

NOTE: When required for servicing purposes the doors may be locked in the open position as in operations (3), (4) and (5).

(3) Isolate the appropriate circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No.1			
SEC. AIR DOOR MTR. SUP	2-213	1K247	C10
SEC. AIR DOOR POSN. IND.	1-213	1K238	F 2
Engine No.2			
SEC. AIR DOOR MTR. SUP	2-213	2K247	F10
SEC. AIR DOOR POSN. IND.	5-213	2K238	C 3
Engine No.3			
SEC. AIR DOOR MTR. SUP	4-213	3K247	A19
SEC. AIR DOOR POSN. IND.	5-213	3K238	C 4
Engine No.4			
SEC. AIR DOOR MTR. SUP	4-213	4K247	F19
SEC. AIR DOOR POSN. IND.	1-213	4K238	F 3

(4) Place a warning placard on panel 1-214, at the 3CM position to the effect that work is taking place in the vicinity of the secondary air doors.

(5) Open the No.1 motor access panel 411 NB and remove the electrical plug from the motor.

D. Close

(1) Comply with the electrical safety precautions.

(2) Re-connect, if necessary, the electrical plug to the secondary air door motor, ensuring that the connections are made in accordance with connector identifications.

(3) Remove the safety clips and reset the circuit breakers.

(4) Set the No.1 SECONDARY AIR DOORS control switch to "SHUT", and check that the MI shows SHUT.

E. Conclusion

(1) Switch off and disconnect electrical ground power (Ref. 24-41-00, Servicing).

NOTE: Operation (2) and (3) are not required unless the motor electrical plug has been removed/disturbed.

(2) Carry out an Operational Test of the secondary air
R doors (Ref. 71-31-00, Adjustment/Test).

(3) Check that the area is clean, close and lock motor access panel 411 NB. Torque load the fasteners to between 25-30 lbf in (0.29-0.34 mdaN).

(4) Remove the warning placard from panel 1-214.

FIRE FLAPS (SECONDARY AIR DOORS AND ENGINE BAY VENTILATION FLAP)- REMOVAL/INSTALLATION

WARNING: COMPLY WITH THE ELECTRICAL SAFETY PRECAUTIONS IN 24-00-00

1. General

This topic contains general instructions for the removal/ installation of minor electrical components fitted to panels and equipment racks that are common to 71-31-00.

A. Introduction

The panels and equipment racks and their associated minor electrical components are as follows.

Power management panel (1-214):
Secondary air doors control switches and magnetic indicators.
Pilots' roof panel, fire control (4-211):
  FIRE FLAPS caption and diodes.
Underfloor equipment bay racking (11-123):
  ADC slave relays, No.4 engine 220 Kt relay and diodes.
Underfloor equipment bay racking (19-123):
  engine shut-down, flap indication control, flap indication inhibit and secondary air door motor control left-hand relays.
Underfloor equipment bay racking (20-123):
  engine shut-down, flap indication control, flap indication inhibit and secondary air door motor control right-hand relays.

B. Panels (Ref. Fig.401 and 402)

Switches, magnetic indicators and diodes are mounted from the rear of the appropriate panel, the components being accessible with the panel lowered on its hinges or with-drawn as appropriate. The caption is mounted from the front of the panel and clamped to the panel at the rear. Diodes have soldered connections to barb insulators mounted on diode boards behind the panel. Cable formers,
R which act as panel strengthening supports at the rear of each panel, support cable looms and terminal blocks which may restrict access to some components, terminals or connectors. These cable looms and terminal blocks may be temporarily moved to improve access to electrical components.
Electrical connections to toggle switches, caption light modules and magnetic indicators are made to socket-type terminals.

C. Underfloor Racking (Ref. Fig. 403, 404 and 405)

The relay boxes and some diodes are mounted in the forward underfloor racking in zone 123. Sufficient cable is provided to allow each box to be withdrawn from the racking for individual component removal without electrically disconnecting the box from the aircraft wiring, thus subsequent test procedures require a test of only the associated circuit component. Components within the boxes are mounted on one side of a vertical chassis with the associated wiring assembled on the reverse side.

The relay boxes do not have a cover on the side, therefore direct access to components is possible. The diodes in each relay box are mounted on an insulation board, secured to the chassis by distance pillars and protected by a diode cover. Relays are of the plug-in type, each being secured to its base by nuts and washers, or by a spring clamp. Diodes have terminal tags crimped to wire ends which are connected to mounting studs with securing nuts and washers.

CAUTION: WHEN INSTALLING ELECTRICAL COMPONENTS, THE TORQUE LOADING OF TERMINAL SECURING DEVICES FOR CERTAIN COMPONENTS MUST BE CARRIED OUT IN ACCORDANCE WITH 20-27-14.

ELECTROLUMINESCENT (EL) PANELS ARE SUSCEPTIBLE TO SCRATCHES AND CRACKS. ENSURE THAT TOOLS DO NOT DAMAGE THE POLISHED WALLS OF THE PANELS.

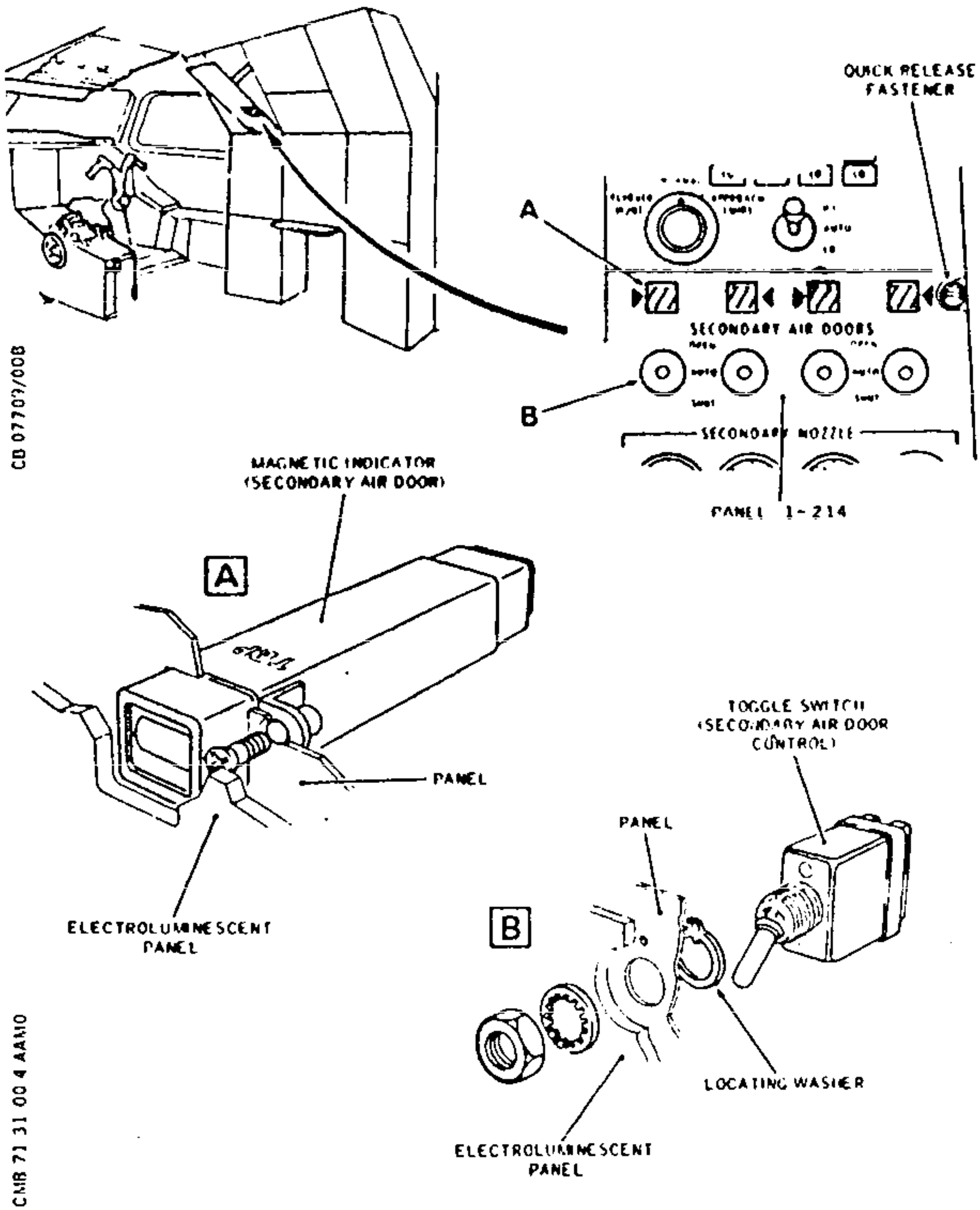
R B 2. Secondary Air Door Current Monitor - Description/Operation

R B A. General

R B The current monitor system comprises four current
R B transformers (CT) and a monitor box. The current trans-
R B formers sense a single phase on each secondary air door
R B monitor supply and feed the induced signals to the monitor
R B box. The current monitor system seeks to give early warning
R B of build-up of friction in the secondary air door actuator,
R B flexible drive or door hinges (reflected by increased
R B current draw in the motor supply).

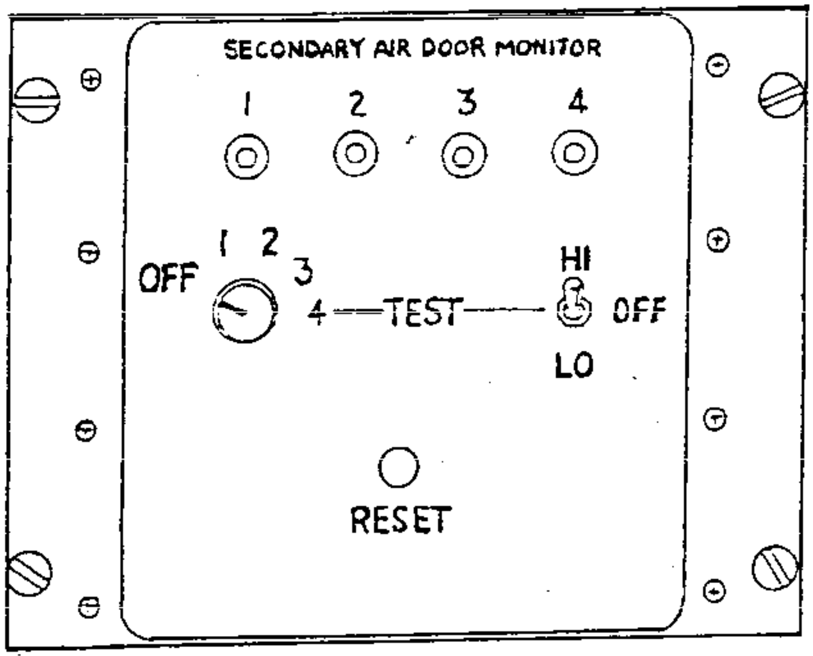
R B B. Monitor Box

R B The monitor box is mounted on the bottom right corner of the
R B Engineering Officer's station. The front panel comprises 4
R B yellow LEDs, a HIGH/LOW centre sprung switch a 5-position
R B channel selection test switch and a reset button (see Fig.
R B 401 bis).



Minor Electrical Components - Panel 1-214
Figure 401

CIC 0124/00A



Monitor Box
Figure 401 bis

The monitor box is supplied with 115v AC, 400Hz from circuit breaker F15 on panel 14-216. When an input signal level from any CT exceeds 60mV (corresponding to a motor current draw of around 3 amps), the monitor box illuminates the appropriate LED.

With the channel selection test switch in any position 1 thru 4, the HIGH/LOW switch may be used to inject a HIGH (70mV) and LOW (50mV) test signal into the selected channel. In the LOW position, no LED will illuminate. In the HIGH position, the
R B selected channel's LED will illuminate after approx 3 seconds. The time delay prevents nuisance monitor trips triggered by in-rush current or transients.

C. Current Transformers

The four CTs are located on the B phase supply cable of the secondary air door motors. The B phase cable acts as the primary winding.

D. Monitor Box - Test

This test checks that each monitor channel illuminates its associated LED correctly.

(1) Close CB F15 on panel 14-216 SAD monitor supply.

(2) Press the RESET button to clear all LEDS.

(3) Place the channel selection test switch to channel 1 and hold the HIGH/LOW switch to the "LOW" position for at least 2 seconds. No LED should illuminate.

Move the HIGH/LOW switch to the "HIGH" position and check that the channel 1 LED illuminates after approx 3 seconds.

(4) Repeat step (3) for channels 2 thru 4.

(5) Press the RESET button to clear all four LEDs and place the channel selection test switch to the "OFF" position.

(6) Remove power.

<u>NOTE</u>: Secondary air doors should not be operated during the monitor box test.

E. <u>Current Transformer (CT)</u> - Test

Equipment - AC millivolt meter 0-100mV.

<u>Procedure</u>

(1) Open CB F15 on panel 14-216
" " C10 on panel 2-213
" " F10 on panel 2-213
" " A19 on panel 4-213
" " F19 on panel 4-213

(2) Remove Monitor control box and disconnect electrical plug.

(3) Connect AC millivolt meter across appropriate pins:

No 1 CT between pins K and J
No 2 CT " " H and F
No 3 CT " " E and D
No 4 CT " " R and V

(4) Close CB on appropriate secondary air door motor supply and associated position indicator supply.

Engine 1 Sec Air door Posn Ind - CB F2 on 1-213
" 2 " " " " " CB C3 on 5-213
" 3 " " " " " CB C4 on 5-213
" 4 " " " " " CB F3 on 1-213

WARNING: ENSURE THAT THE AREA ROUND THE SECONDARY AIR DOORS IS CLEAR OF PERSONNEL AND EQUIPMENT.

(5) Make electrical ground power available (ref 24-41-00).

(6) Ensure that the associated engine shutdown handle (emergency only) is in the fully in position. Check that the aircraft is electrically on the ground.

CAUTION: DO NOT OPERATE DOORS MORE THAN ONE COMPLETE CYCLE IN TWO MINUTES.

(7) Select the appropriate secondary air door control switch (1-214 panel) to open (indicator should show "cross hatch" and then "OPEN") and note the steady state millivolt reading output from the CT during door movement.

(8) Reselect the secondary air door control switch to "AUTO" and again note steady state millivolt output of CT during door movement.

The average steady state reading between opening and shutting runs should be greater than 35 mV (corresponds to a motor current draw of approx. 1.7 amperes).

(9) Repeat paras (3) thru (8) as necessary for other CTs.

(10) Reconnect electrical plug to monitor box and secure in panel.

(11) Return power supplies to normal.

NOTE: If a CT fails para (8) carry out current draw test (ref. MM 71-31-00, page block 500) before changing the CT.
Action as necessary.

F. Monitor Box - Removal/Installation

Removal

(1) Open CB F15 on panel 14-216 (SAD monitor supply)
Open CB C10 on panel 2-213)
Open CB F10 on panel 2-213)- Secondary air door 3-
Open CB A19 on panel 4-213) phase supply
Open CB F19 on panel 4-213)

Attach "DO NOT CLOSE" identifiers

(2) Release the zeus type fasteners (4 off) and slide monitor box forward.

R (3) Disconnect the electrical plug.

R Installation

R (4) Open circuit breakers as per para F (1).

R (5) Connect the electrical plug.

R (6) Slide monitor box home and secure fasteners (4 off).

R (7) Remove "DO NOT CLOSE" identifiers and close all circuit
R breakers as per para F (1).

R (8) Carry out monitor box test as per para D.

R G. Current Transformer - Removal/Installation

R (1) (a) Open CB F15 on panel 14-216. SAD Monitor Supply.

R (b) Open as appropriate:

R Engine No 1 secondary air door CB C10 on 2-213
R Engine No 2 " " " CB F10 on 2-213
R Engine No 3 " " " CB A19 on 4-213
R Engine No 4 " " " CB F19 on 4-213

R Refer WDM 71-31-01 for engine 1
R " " 71-31-02 for engine 2
R " " 71-31-03 for engine 3
R " " 71-31-04 for engine 4

R (2) Hinge open the appropriate panel ensuring that power has
R been isolated to other bushbars on the panel. Identify
R the required circuit breaker and the "B" phase wire.
R Locate the B2 terminal and disconnect it from the circuit
R breaker.

R (3) Disconnect the CT and slide it off the "B" phase wire.

R (4) Slide the new CT over the "B" phase wire and reconnect
R the B2 terminal.

R Tie the CT to the loom, making sure that the CT will not
R cause any adjacent cable chafe.

R Connect the flyleads of the CT to the cables by means of
R a splice and secure to the existing loom in accordance
R with standard practices.

R (5) Close the panel and reconnect the supplies.

R (6) Carry out current transformer test as per para E.

R H. Secondary Air Door current monitor system - Trouble Shooting

R In the event of a channel monitor light illuminating during
R movement of the associated secondary air door:

R (1) carry out a monitor test. If this proves satisfactory,
R proceed with (2).

R (2) carry out current draw and torque check on the
R appropriate secondary air door system iaw MM 71-31-00,
R page block 500.
R Action as necessary.

R NOTE: Investigative action after a monitor light
R illumination MUST NOT be deferred at LHR.

R 3. Electrical Components Mounted on Panel 1-214

A. Prepare (Ref. Fig. 401)

NOTE: On electrical components with socket-type terminals the pin inserts must be disconnected and connected in accordance with the Wiring Diagram Manual, 20-42-18.

(1) Isolate the electrical generation and external power in accordance with 24-00-00, Servicing.

(2) Loosen the screws and withdraw the electroluminescent panel (Ref.33-16-00), sufficiently to gain access to the securing screws.

(3) Loosen the quick-release fasteners securing the panel, press in the spring retaining clip and lower

the panel on its hinges to the extent of the check cords.

B. Remove Toggle Switch

RB NOTE: The white rubber cap may be replaced insitu.

(1) Withdraw the pin inserts from the rear of the switch in accordance with Wiring Diagram Manual 20-42-18.

(2) Using a tubular spanner, remove the nut and washer from the front of the panel; withdraw the switch and locating washer from the panel rear.

C. Install Toggle Switch

(1) Comply with the electrical safety precautions.

(2) Position the locating washer on the switch and insert the switch through the opening from the panel rear; ensure that the lug on the washer engages the locating hole in the panel.

(3) Secure the switch with the nut and washer.

(4) Connect the electrical cables to the switch, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram. Connect pin inserts in accordance with Wiring Diagram Manual 20-42-18.

D. Remove Magnetic Indicator

(1) If necessary, release the cable loom ties to gain access to the terminals at the rear of the magnetic indicator.

(2) Withdraw the pin inserts from the rear of the indicator, in accordance with Wiring Diagram Manual 20-42-18.

(3) Loosen the screws and withdraw the electroluminescent panel (Ref.33-16-00).

(4) Remove the securing screws from the front of the panel and withdraw the magnetic indicator from the panel.

E. Install Magnetic Indicator

(1) Comply with the electrical safety precautions.

(2) Assemble the magnetic indicator to the panel from the rear, ensuring that the word TOP on the body of the

indicator is aligned with the white painted line at the back of the panel.

(3) Secure the indicator to the panel with the securing screws, from the front.

(4) Connect the electrical cables to the indicator terminals, ensuring that the connections are made in accordance with the cable identification and the applicable wiring diagram. Connect pin inserts in accordance with Wiring Diagram Manual 20-42-18.

(5) Secure the cable loom ties, as necessary, in accordance with 20-27-15.

F. Conclusion

(1) Check that the area is clean, close the panel and secure it with the quick-release fasteners.

(2) Secure the electroluminescent panel (Ref.33-16-00).

(3) Make available electrical ground power Ref.24-41-00.

(4) Carry out the secondary air door Operational Test (Ref.71-31-00, Adjustment/Test).

R 4. Electrical Components Mounted on Panel 4-211

A. Equipment and Materials

DESCRIPTION	PART NO.
Extraction tool, caption light module spring clamp	-
Torque spanner 60-70 lbf in (0.69 - 0.79 mdaN)	-

B. Prepare (Ref. Fig. 402)

NOTE: On electrical components with socket-type terminals the pin inserts must be disconnected and connected in accordance with the Wiring Diagram Manual, 20-42-18.

(1) Isolate the electrical generation and external power

in accordance with 24-41-00, Servicing.

(2) Release the quick-release fasteners securing panel 4-211 and withdraw the panel sufficiently to gain access to the caption light module and diode boards.

C. Remove Caption Light Module

(1) If necessary, release the cable loom ties for access to the terminals at the rear of the caption light module.

(2) Withdraw the pin inserts from the rear of the module in accordance with Wiring Diagram Manual 20-42-18.

(3) Using the extraction tool disengage the clamp retaining springs at the rear of the module and remove the module from the front of the panel and the clamp from the rear.

D. Install Caption Light Module

(1) Comply with the electrical safety precautions.

(2) Position the clamp on the rear of the panel and insert the caption light module through the hole from the front. Ensure that the white-painted line on the back of the panel and the hinged edge of the module are in alignment, and that the clamp is aligned symmetrically with the module.

(3) Hold the module firmly against the panel front and simultaneously press the clamp into position from the rear until the retaining spring engages with the recesses in the module body.

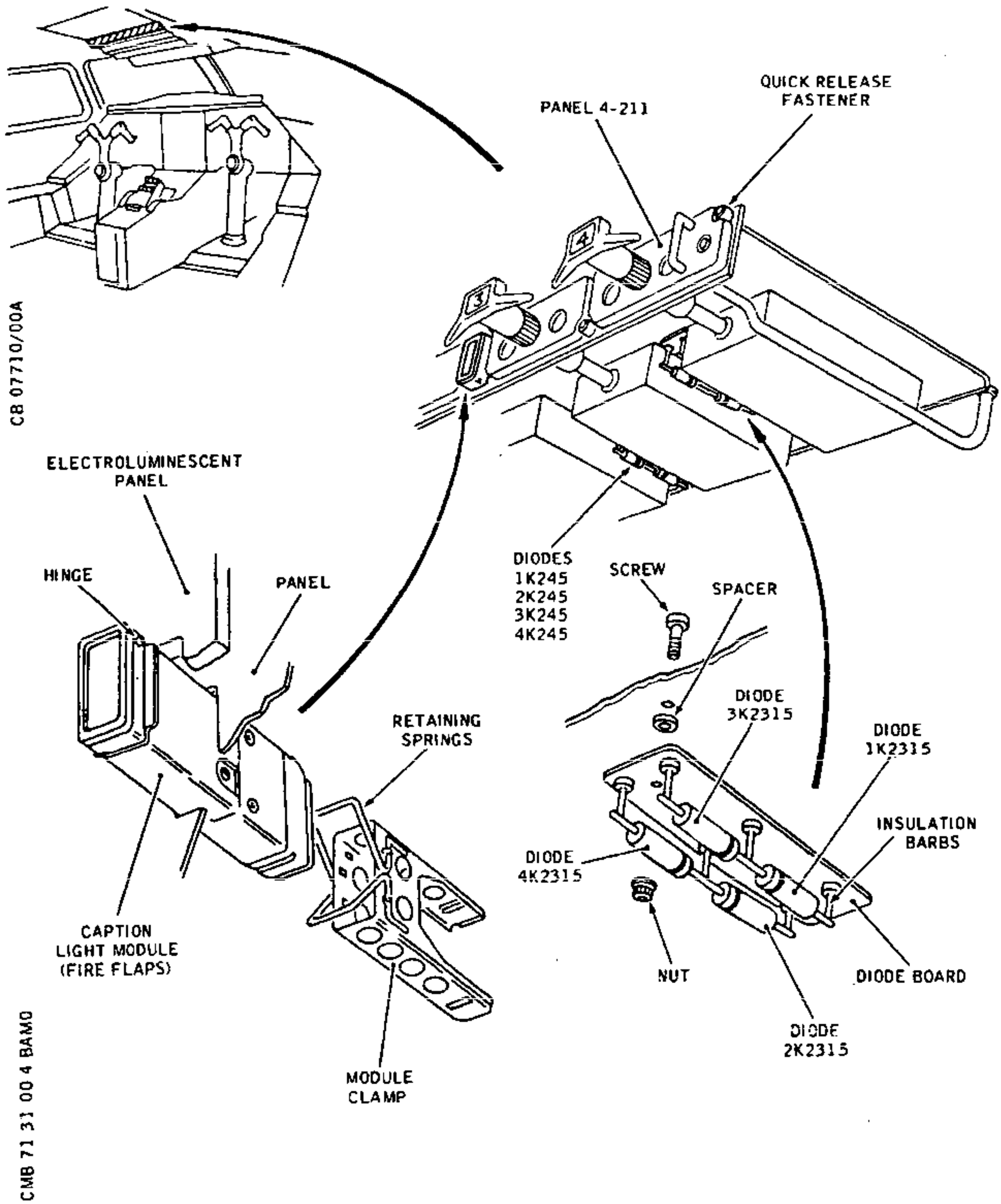
(4) Connect the electrical cables to the module, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram. Connect pin inserts to the module in accordance with Wiring Diagram Manual 20-42-18.

(5) Secure the cable loom ties, as necessary, in accordance with 20-27-15.

E. Remove Diode

(1) If neccessary, release the cable loom ties to gain access.

(2) If necessary for access remove the nuts and washers



Minor Electrical Components - Panel 4-211
Figure 402

securing the diode board, retain the screws, nuts and spacers and using the cable slack, move the diode board to a position where it is accessible for soldering.

(3) Unsolder the diode wire ends from the insulation barbs and remove the diode from the board.

F. Install Diode.

NOTE: Solder the diode insulation barbs in accordance with Wiring Diagram Manual, 20-42-23.

(1) Comply with the electrical safety precautions.

(2) Position the replacement diode with the black ring on the cathode end of the diode pointing to terminal 2 on the diode board. Solder the wire ends to the associated barbs in accordance with Wiring Diagram Manual 20-42-23.

(3) Refit the diode board and secure it with the screws spacers and nuts. Torque load each nut to between 60 and 70 lbf in (0.69 - 0.79 mdaN).

(4) If necessary, secure the cable loom ties, disturbed for access, in accordance with 20-27-15.

G. Conclusion

(1) Check that the area is clean, close the panel and secure it with the quick-release fasteners.

(2) Cancel the electrical generation and external power precautions.

(3) When a FIREFLAP caption light module or a diode is changed carry out a Fire Flaps functional test (Ref.71-31-00, Adjustment/Test) on each engine system.

R 5. Electrical Components Mounted in Racking 11-123,19-123 and 20-123

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner 0.5 lbf in (0.056 mdaN)	-
Torq-set screwdriver	MS33781

B. Prepare (Ref. Fig. 403, 404 and 405)

(1) Isolate the electrical generation and external power in accordance with 24-00-00, Servicing.

(2) Open the service compartment door 123BB (Ref.52-41-11) to gain access to LH and RH engine relay boxes 19-123 and 20-123 or to miscellaneous relay box 11-123.

(3) Release the hold down fasteners from the appropriate engine, or miscellaneous relay box hold down hooks.

(4) Withdraw the panel from the rack sufficiently to gain access to the quick-release cable clamps on top of the box.

(5) Release the cable clamps to detach the cables from the top of the box.

(6) Move the box clear of the rack and lower it onto a suitable support.

C. Remove Relay

(1) Remove the nuts and washers or the spring clamp, as applicable, securing the relay to its mounting base and withdraw the relay from the socket.

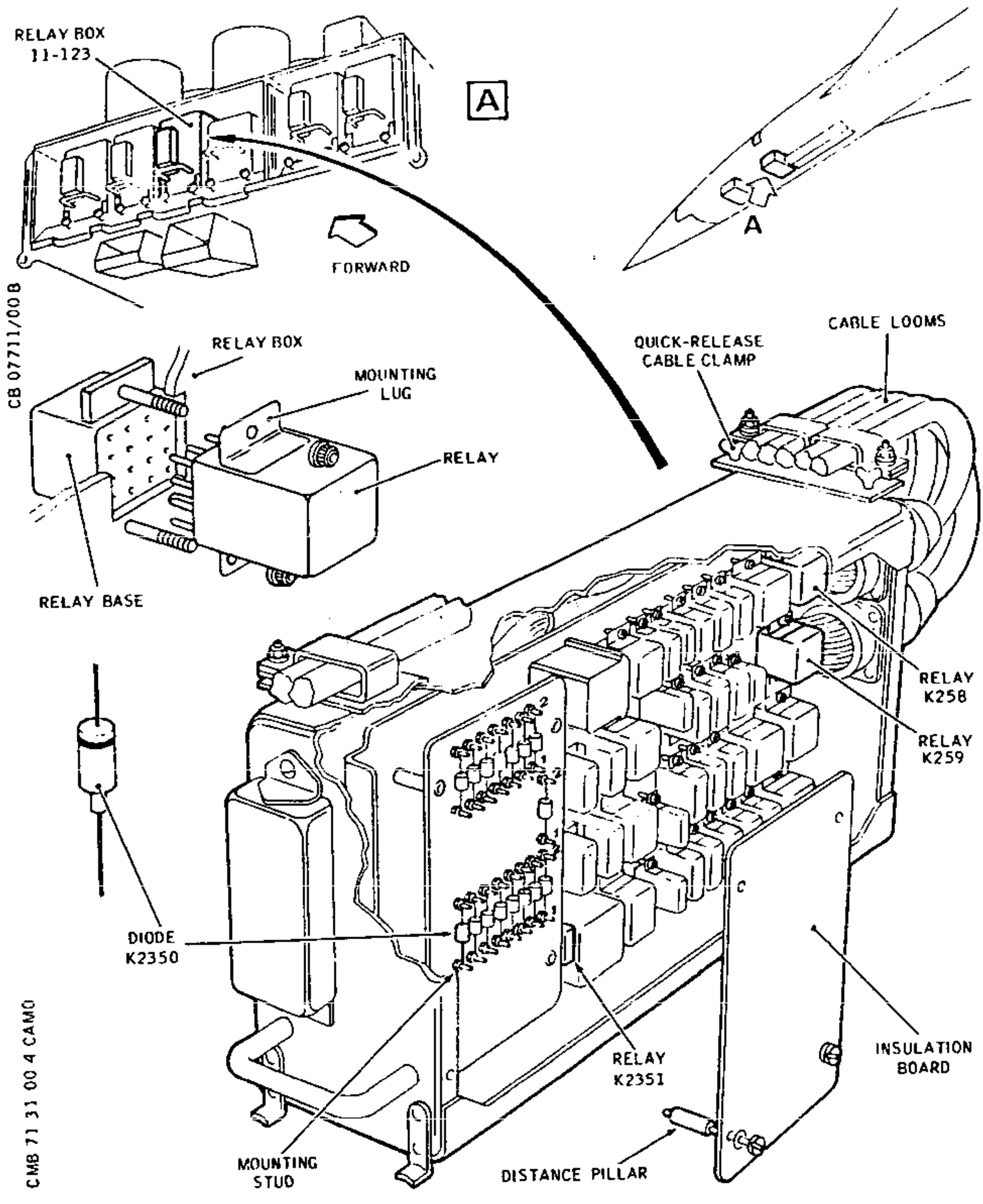
D. Install Relay (Ref. Fig. 403, 404 and 405)

(1) Comply with the electrical safety precautions.

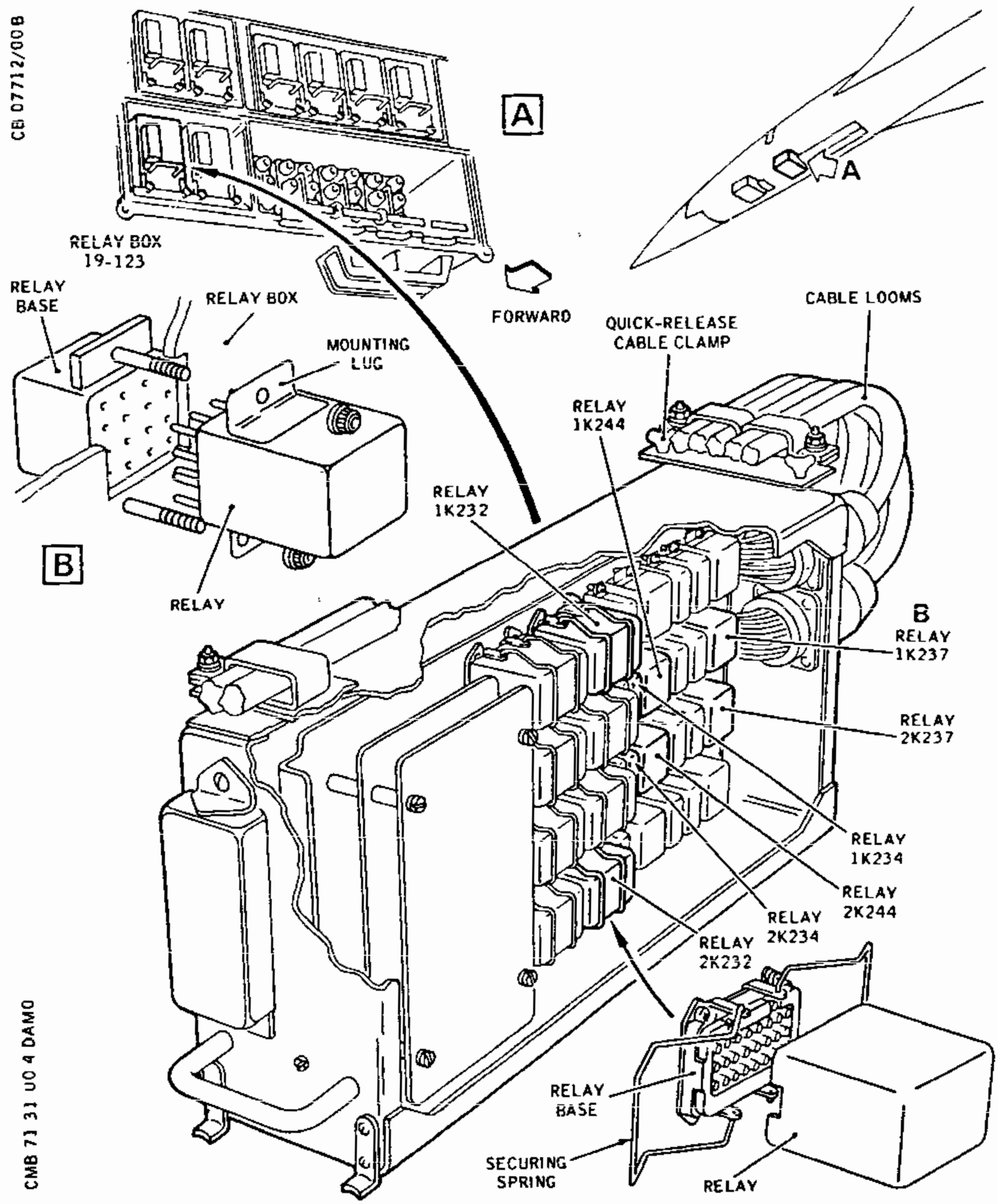
(2) Check that the relay pins are clean and undamaged.

NOTE: Operation (3) is necessary only if one of the named relays is being refitted.

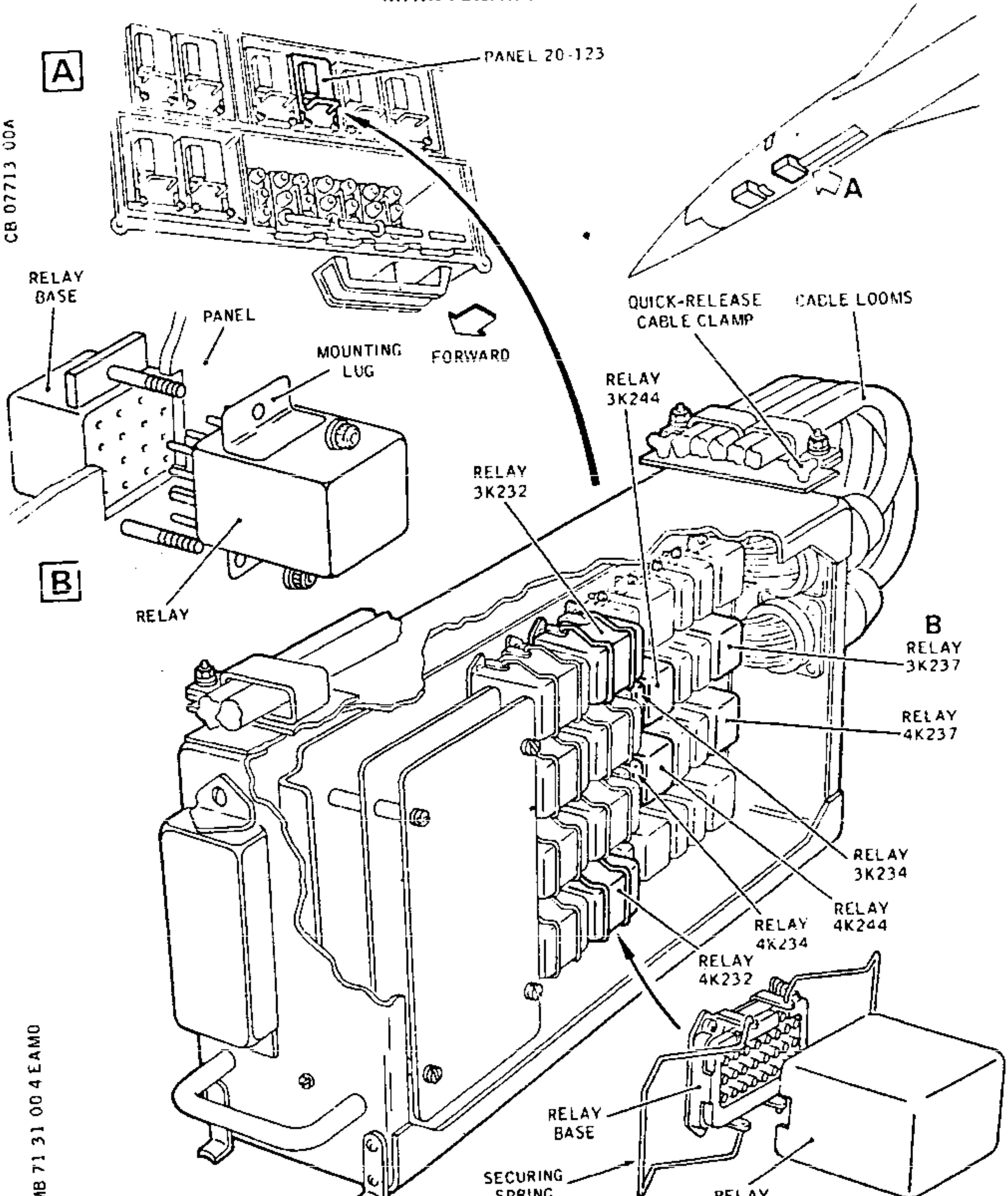
(3) On 'half crystal can size' relays (1K0234,2K0234, 3K0234,4K0234) check that the mounting lugs are at 90 deg to the relay body. Re-align the lugs



Minor Electrical Components - Relay
Box 11-123
Figure 403



Minor Electrical Components - Relay
Box 19-123
Figure 404



Minor Electrical Components - Relay
Box 20-123
Figure 405

as necessary.

(4) Align the locating pin on the relay body with the locating hole in the relay mounting base and plug the relay into the socket.

(5) Secure the relay body to the mounting base with the nuts and washers, or the spring clamp, as applicable.

E. Remove Diode (Ref. Fig. 403)

(1) Remove the screws securing the diode board cover to the distance pillars and remove the cover from the diode board.

(2) Disconnect the diode from the mounting studs and remove the diode.

F. Install Diode (Ref. Fig. 403)

(1) Comply with the electrical safety precautions.

NOTE: If the replacement diode does not have tags fitted to wire ends, the terminal tags must be crimped to the ends in accordance with the Wiring Diagram Manual, 20-21-01. Tags for diodes are, pin 1, Solidstrand AMP34105, and pin 2, Solidstrand 34104-T006-02.

(2) Position the replacement diode so that the black ring on the cathode end is pointing to terminal 2 on the diode board. Secure the tags to the mounting studs with the nuts and washers. On size 6 stud, torque-tighten the terminal nut to 0.5 lbf in (0.056 mdaN).

(3) Check that the area is clean and refit the diode board cover to the distance pillars and secure it with the screws using torq-set screwdriver MS33781.

G. Conclusion

(1) Mount the relay box on the end of the rack support rails and secure the cables to the top of the panel with the quick-release cable clamps.

(2) Slide the box into the racking and secure it with the hold down fasteners.

(3) Check that the relay box is bonded in accordance with 20-27-11.

(4) Cancel the electrical safety precautions and check the operation of the component by carrying out an operational test (Ref.71-31-00, Adjustment/Test).

(5) Check that the area is clean, close and lock service compartment door 123BB (Ref.52-42-11).

FIRE FLAPS (SECONDARY AIR DOORS AND ENGINE BAY VENTILATION FLAP) - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

This topic details the adjustment of the secondary air door system, functional and operational tests of the secondary air door system and the operational test of the fireflaps system.

Adjusting the secondary air door system must be carried out with all components in the shut datum position. When checking the complete system, the adjustments must be carried out in sequence.

The functional test of the secondary air door system is carried out from the nacelle using a ground test set. This test checks the integrity of the mechanical parts by directly controlling the secondary air door motor and checking the signal from the indication switch unit. The test set operates from an independent three phase and neutral 200V, 400 Hz supply. The functional test is usually carried out prior to the operational test of the secondary air door system.

The operational test of the secondary air door system checks the manual control using the OPEN and SHUT positions of the control switch at the 3CM station and the air data computer control using the AUTO SWITCH position.

When carrying out the latter part of the test the air data computer test switches ADC 1 and ADC 2 on the centre console are used to simulate the air speed signal. The ADC 1 test switches are associated with engine Nos. 1 and 4 and the ADC 2 switches with engine Nos. 2 and 3.

The operational test of the fire flaps system checks that the secondary air doors and the engine bay ventilation flap close when the fire handle is pulled.

To gain access to the secondary air door system and engine bay ventilation flap, open the engine bay forward door and the secondary air door motor access panel. If access is required to the top centre wall secondary air doors, it is necessary to remove the engine intake rings. (Ref. 71-21-11).

The adjustment/tests are detailed for No.1 engine bay; other engine bays are similar.

R B

R B Switch units are set in the workshops to the DATUM SHUT

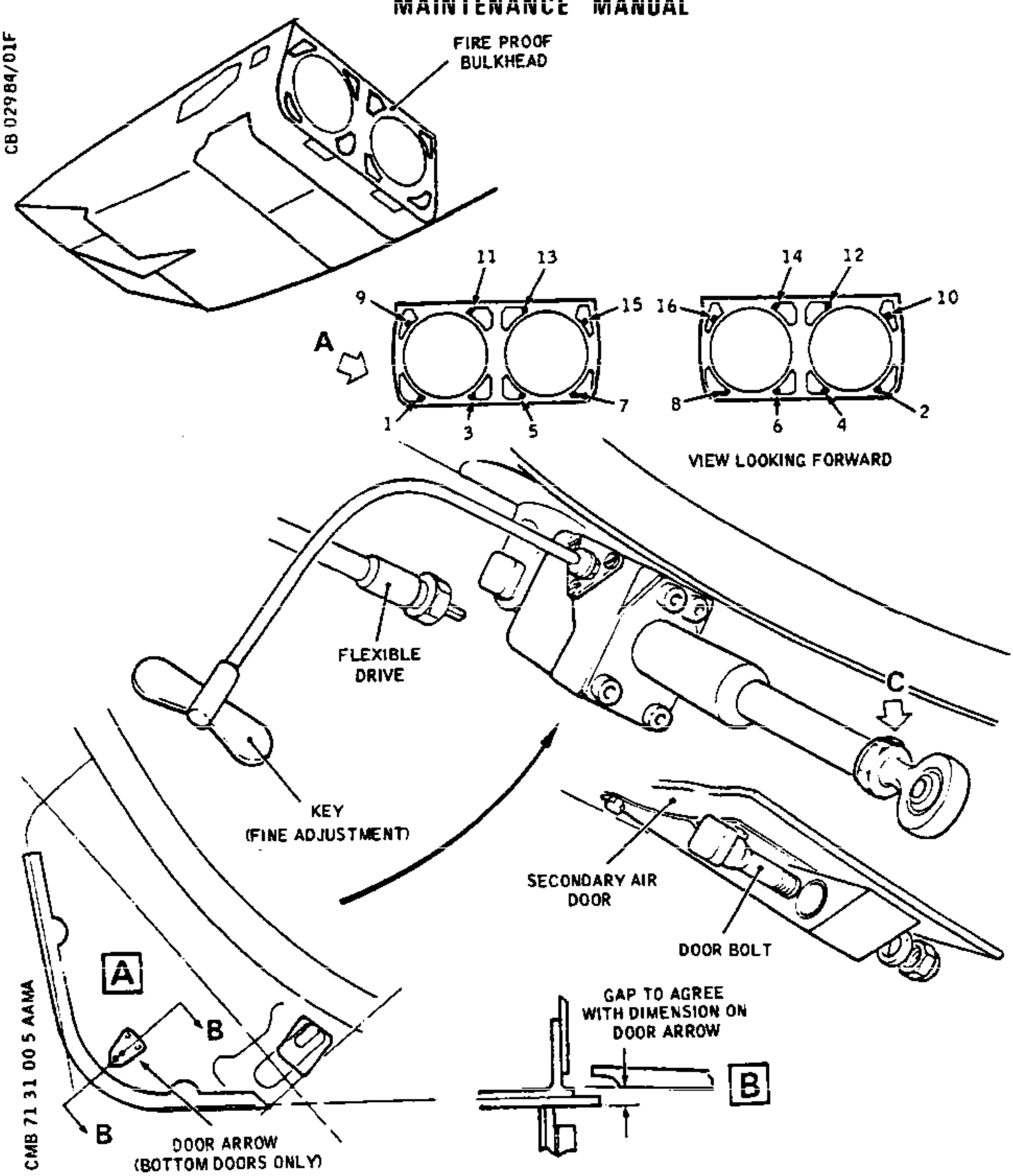
B position. The aircraft secondary air door system must be
B put in the DATUM SHUT position before the switch unit is
B fitted to the aircraft. DO NOT TURN THE DRIVE SHAFT OF A
B SWITCH UNIT RECEIVED DIRECT FROM STORES. If this happens
B the switch unit MUST be repositioned in the DATUM SHUT
B position IAW MM 71-31-16 Page 501. No mechanical
B resistance will be felt when the switch unit is over-
B travelled by hand to the point that the drive shaft pin
B shears.

2. Secondary Air Doors - Adjustment (Ref. Fig. 501)

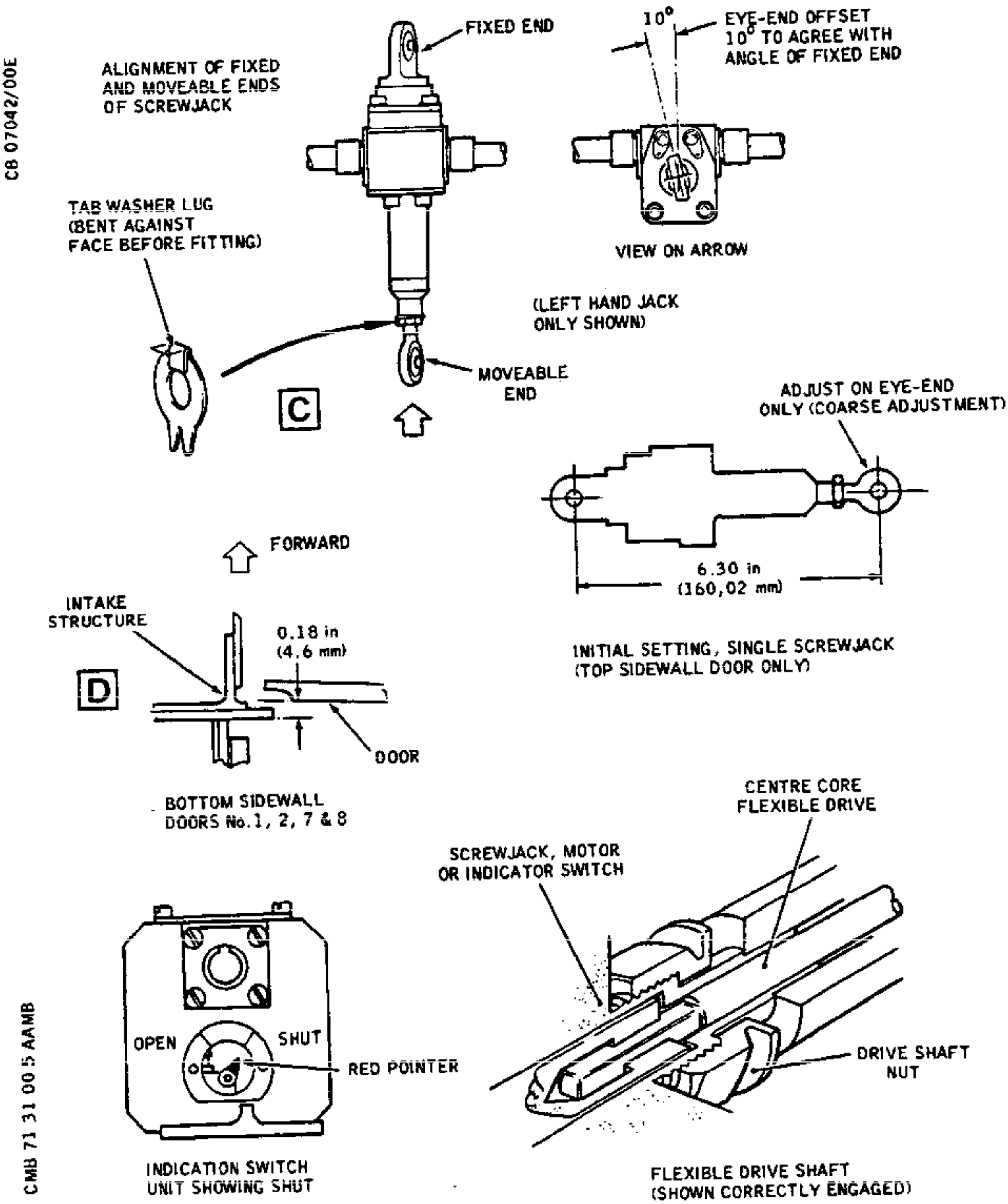
NOTE: The adjustment for motor brake wear is included in the secondary air door functional test, (para.4).

A. Equipment and Materials

DESCRIPTION	PART NO.
Electrical power supply: 200V, 3 phase, 400 Hz with a fourth neutral wire	-
Circuit breaker safety clips	-
Key, flexible shaft	D925407000
Interphone equipment	-
Corrosion resistant steel wire 0.031 in (0.8 mm)	DTD189
Test set	TE5101
R B Ammeter 0-5 amps	
Torque limiting screwdriver range: 25-30 lbf in. (0.29 - 0.34 mdaN)	-
Torque spanners range:	
25-30 lbf in.(0.28-0.34 mdaN)	
40-65 lbf in.(0.45-0.73 mdaN)	-
50-60 lbf in.(0.56-0.68 mdaN)	-
60-70 lbf in.(0.68-0.79 mdaN)	-
R B Torque watch gauge 0 - 40 oz.ins.	651 C-3
Viton sealant (Ref.20-30-00, No.351)	-



Secondary Air Door - Adjustment
(Sheet 1 of 2)
Figure 501



Secondary Air Door - Adjustment
(Sheet 2 of 2)
Figure 501

B. Preparation

WARNING: ENSURE THAT THE AREA AROUND THE SECONDARY AIR DOORS IS CLEAR OF PERSONNEL AND EQUIPMENT.

(1) Open the engine bay forward lower door (Ref.71-00-00, Servicing).

(2) Trip the following additional circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No.1			
ENG 1 SEC AIR DOOR MTR SUP	2-213	1K147	C10
ENG 1 SEC AIR DOOR POSN IND	1-213	1K238	F2
Engine No.2			
ENG 2 SEC AIR DOOR MTR SUP	2-213	2K247	F10
ENG 2 SEC AIR DOOR POSN IND	5-213	2K238	C3
Engine No.3			
ENG 3 SEC AIR DOOR MTR SUP	4-213	3K247	A19
ENG 3 SEC AIR DOOR POSN IND	5-213	3K238	C4
Engine No.4			
ENG 4 SEC AIR DOOR MTR SUP	4-214	4K247	F19
ENG 4 SEC AIR DOOR POSN IND	1-213	4K238	F3

(3) If access is required to the top secondary air door nearest the engine bay centrewall, remove the forward and aft intake ring (Ref.71-21-11, Removal/ Installation).

NOTE: An assessment of secondary air door clearance may be made on the two bottom doors without removing the intake rings.

(4) Connect the interphone (Ref.23-41-00)

(5) Release the fasteners and open the No.1 motor access panel (411 NB).

R B C. Preliminary Test

R B (1) Carry out current draw check on all 3 phases of the
R B S.A.D. actuator in both opening and closing sense.

R B If current on any phase exceeds 2.80 amps further
R B investigation must be carried out to determine cause
R B of high current draw.

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B (2) Disconnect flexible drive from actuator and connect
B square end drive to torque watch gauge Pt.No.651C-3.
B Rotate doors in opening sense and observe torque at no
RB time exceed 10 oz. ins.

B Should this figure be exceeded, break down the system
B gradually and repeat torque check until cause of high
B torque is determined.

NOTE: When disturbing drive system ensure rigging is not alerted prior to reconnection.

D. Adjustment

NOTE: Torque-tighten bolts (Ref.20-21-11).

Wirelock nuts and bolts (Ref. 20-21-13).

Encapsulate nuts/bolts in Viton (Ref.20-22-19).

Lock screwjack eye-end with a tabwasher (Ref.20-21-17).

Electrically and mechanically disconnect the secondary air door (Ref. 71-31-12 to 71-31-16, Removal/Installation).

(1) Rotate each screwjack drive 20 revolutions from the retract stop:

NOTE: Screwjacks on receipt from stores are fully retracted and labelled accordingly, but must have an eye-end fitted. (Ref.71-31-15, Removal/Installation).

(a) Remove the covers from the drive apertures.

(b) Using the flexible drive shaft key, turn each screwjack drive to check that it bottoms against the retract stop. Then reverse the rotation and turn the drive 20 revolutions from the stop. Do not disturb this setting; the jack is now in the 'shut datum' position.

(2) Set the indication switch unit:

NOTE: The following procedure is not necessary for a switch unit received from stores in the 'shut datum position.

(a) Connect the INDICATION RECEPTACLE on the test set to the receptacle on the indication switch unit.

(b) Connect the test set SUPPLY receptacle to a 3 phase, 200V, 400 Hz power source with a fourth neutral wire.

(c) Check that the test set indication microswitch lamp SHUT S/W light is ON.

(d) Turn the switch unit input shaft anti-clockwise until the SHUT S/W light goes out. Stop and turn in the opposite sense until the SHUT S/W light relights, continue to turn a further 55 revolutions in the same direction then stop.

NOTE: The SHUT direction of rotation is clockwise viewed from the input shaft of the indication switch unit.

CAUTION: THE SWITCH UNIT IS NOW IN THE 'SHUT DATUM' POSITION. DOT NOT ROTATE THE SWITCH DRIVE AFTER THIS ADJUSTMENT IS COMPLETED.

(3) Set the motor:

NOTE: The following procedure is not necessary for a motor received from stores in the 'shut datum' position.

(a) Connect the MOTOR receptacle on the test set to the receptacle on the motor.

CAUTION: DO NOT OPERATE THE MOTOR MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

(b) With no load on the motor, select "OPEN" on the MOTOR switch and press the INCHING CONTROL button until the motor stops. Check that the motor switches off correctly.

(c) Select "SHUT" on the MOTOR switch and press the INCHING CONTROL button until the motor stops. Check that the motor switches off correctly.

NOTE: The motor is now in the 'shut datum' position 'bench run shut with no load'.

(d) Switch off the test set.

(4) Set the clearances on the secondary air doors (except the top sidewall door):

NOTE: 1. The top sidewall door has to be connected and adjusted in the open position, operation (6).

2. The following is a coarse adjustment of 0.0357 in (0.9068mm) per turn, achieved using the screwjack eye-end, (Ref. Fig. 501). If the settings cannot be achieved then it is permissible to use the fine adjustment, operation (5).

R

(a) On each door in turn, handhold the door shut with moderate hand pressure. In this condition it should be possible to engage the door bolt, in the eye-end of the screw-jack and the door bracket, without disturbing the door setting.

(b) If necessary, loosen the locknut and adjust the eye-end of the screwjack until the correct setting is obtained.

(c) Align the eye-end with the 10° offset bearing on the forward end of the screwjack (Ref.Detail C).

NOTE: When fitting or adjusting an eye-end a new tabwasher is to be used and the tab-washer lug is to be bent over 90° before fitting; the bent over lug is to lodge in the slot of the screwjack (Ref. 71-31-15, Removal/Installation).

(d) Torque load the locknut securing the eye-end to between 25 and 30 lbf in (0.29-0.34 mdaN) and lock the tabwasher (Ref. 20-21-17).

(e) Check that the inspection hole in the screwjack is blocked by the eye-end.

(f) Fill the undercut and protruding thread of the eye-end with sealant (Ref.20-22-12).

NOTE: Ensure that the face of the eye-end locknut is free of sealant.

(5) Set the clearances on each secondary air door fine adjustment (Ref. Fig. 501).

NOTE: This procedure is only adopted when the coarse adjustment will not give the correct setting.

(a) Using the key turn the internal screwjack drive, clockwise viewed from the motor driven end, not more than six revolutions towards SHUT.

NOTE: Each turn of the key alters the length,

between the screwjack body and eye-end centres, by 0.003 in (0.08 mm).

(6) Set the clearances on the top sidewall door:

(a) Loosen the locknut and, using the eye-end adjustment, extend the screwjack to a dimension of 6.3 in (160.02 mm) between the pin centres as shown in Detail C (Ref. Fig. 501).

CAUTION: ENSURE THAT THE EQUIPMENT SETTINGS ARE NOT DISTURBED FROM THE 'SHUT DATUM' POSITION.

(b) Connect each flexible drive shaft in turn, (Ref. 71-31-13m Removal/Installation) engaging the squared ends of the drive shafts with the screwjack, motor and indication switch drive connections, until the complete drive is connected with the end nuts tightened to a nominal torque.

(c) Temporarily connect the three screwjacks (Ref. para. (4)) to their respective doors using a bolt.

(d) Connect the test set (Ref. para. (4)), ensuring that the test set switches are at "SHUT".

(e) Open the doors using the test set, ensuring that the top sidewall screwjack is free to extend.

(f) Insert the sidewall top door bolt.

(g) Close the doors using the test set (Ref. para. (4)).

NOTE: It may be advantageous to carry out the additional check for correct functioning of the indication switch unit at this point, as in operation (10).

(h) Check the door does not stand proud of the sealing angles. Check also that it does not impinge on the structure.

NOTE: Ideally the door should make firm but not forceful contact with the sealing angles.

(j) Open the doors, adjust the jack eye-end at the open position, close and check again and repeat as necessary until the setting is correct. Then set the angle of the screwjack
R eye-end and torque load the locknut as previously described in operation (4)(b) to (f).

NOTE: The fine adjustment detailed in operation (5), may be used if the clearances are not obtained by this method.

(7) Close the doors and check that the other doors are still correctly adjusted.

NOTE: When a door has been set correctly and is connected to its associated screwjack it should be possible to just raise the door from its sealing angles with moderate hand pressure applied at its extremities.

(8) Open doors and torque-tighten each end of each drive-shaft to between 40 and 65 lbf in (0.45 and 0.73 mdaN).

(9) Secure each screwjack to the door with the bolt washer and nut. Torque load the nut to between 50 and 60
R lbf in. (0.57 and 0.68 mdaN).

NOTE: It is necessary to open the doors to torque the bolt on the top sidewall door jack.

(10) Additional check to ensure that the indication switch unit is set correctly:

(a) Using the test set (Ref. para 4) inch the doors towards SHUT. Stop immediately when the INDICATION MICRO-SWITCH SHUT S/W red light illuminates.

(b) Measure the distance between the aft face of the door and the aft face of the door sealing angle as shown in Detail D (Ref. Fig. 501); this should be a minimum of 0.18 in (4.57 mm).

(11) Functionally test the secondary air doors (Ref. para. 4) with the exception of the Conclusion procedure.

(12) Check the torque on each flexible drive shaft nut and lock it with wire to the adjacent component.

(13) Encapsulate using Viton (Ref.20-22-16) the bolt heads and nuts securing the motor, indication switch unit, screwjacks and the C-clips securing the flexible drive shafts. Do not put Viton on the flexible drive shaft end nuts.

D. Conclusion

(1) Disconnect the test set and reconnect the aircraft electrical cables ensuring that the connections are made in accordance with the connector identifications.

(a) Disconnect the test set from the indication switch and motor.

(b) Connect the aircraft electrical connector to the indication switch and motor.

(2) Remove the safety clips and reset the circuit breakers previously tripped.

(3) Check that the aircraft is clean and carry out an operational test of the secondary air doors (Ref. para 3).

(4) Close and lock the motor access panel. Torque load each fastener to 25-30 lbf in
R (0.28-0.34 mdaN).

(5) Remove the interphone. (Ref. 23-41-00).

(6) If necessary, reconnect the forward and aft intake rings (Ref. 71-21-11).

(7) Check that the area is clean, close and lock the engine bay door (Ref. 71-00-00, Servicing).

3. Secondary Air Doors Operational Test (Ref. Fig. 502)

A. Preparation

WARNING: ENSURE THAT THE AREA AROUND THE SECONDARY AIR DOORS IS CLEAR OF PERSONNEL AND EQUIPMENT.

(1) Make available electrical ground power (Ref. 24-41-00).

(2) Ensure that the No.1 engine shut-down handle (emergency only) is in the fully in position.

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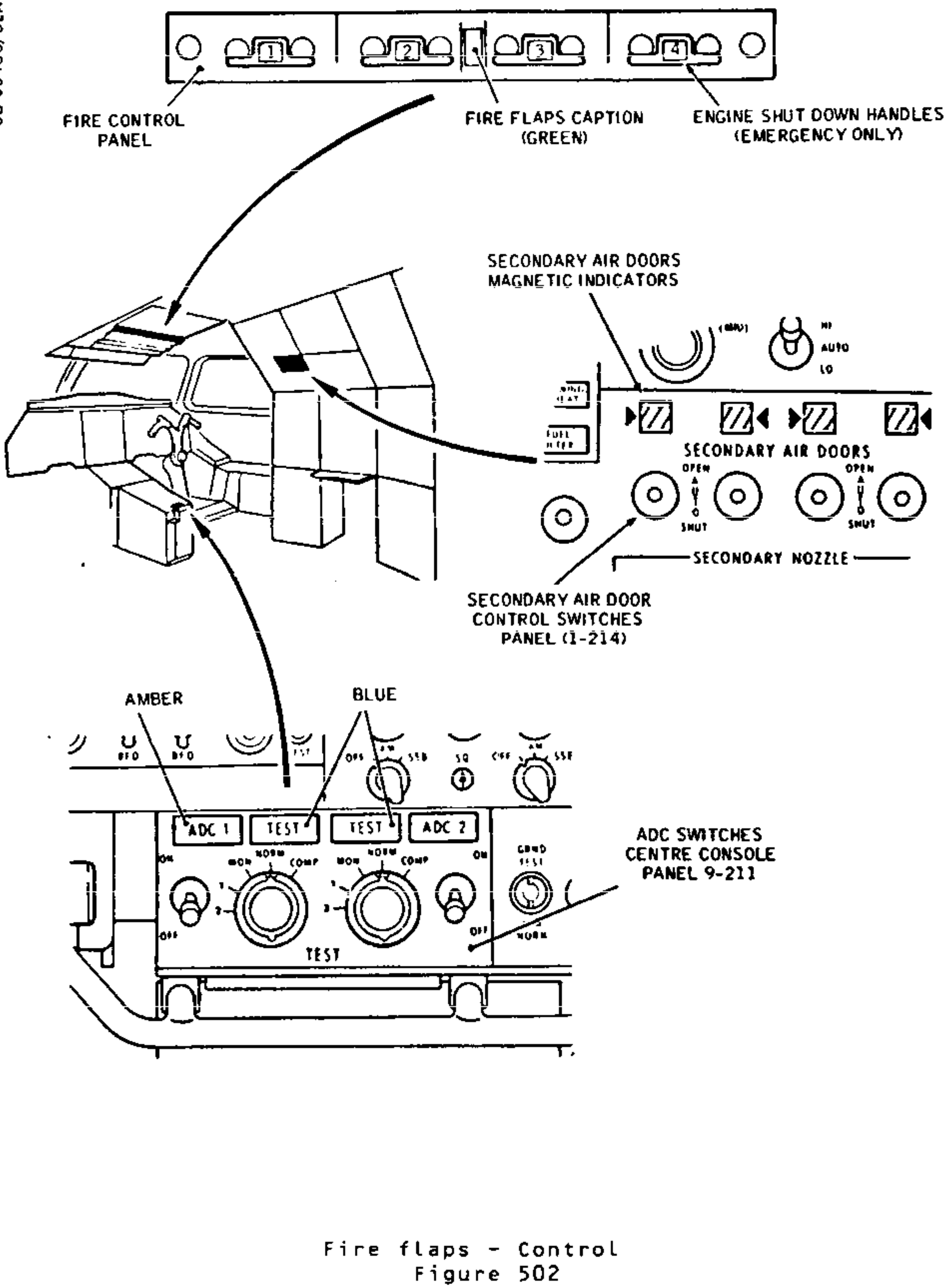

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Fire flaps - Control
Figure 502

(3) For this test the aircraft is to be in an electrical ground condition; landing gear weight switches in the ground position.

B. Test

CAUTION: DO NOT OPERATE THE DOORS MORE THAN ONE CYCLE OF OPERATION IN TWO MINUTES.

NOTE: The test is for engine bay 1 and is similar for engine bay 4. For engine bays 2 and 3 use ADC 2 controls.

(1) Set the No.1 control switch at the 3CM position to "OPEN", and check that the magnetic indicator (MI) shows diagonal stripes then "OPEN".

(2) Set the control switches at the 3CM position for Nos 2, 3 and 4 engines to "SHUT".

(3) Set the No.1 control switch to "AUTO", and check that the MI shows diagonal stripes then "SHUT".

(4) Pause for two minutes then, with the No.1 secondary air door control switch at "AUTO" simulate an airspeed in excess of 0.26M and check that the secondary air doors open:

NOTE: The secondary air doors on No 4 engine operate on a 220 kts speed signal.

(a) Isolate stick shaker circuit breaker W513 map ref. P15 on panel 1-213.

(b) Ensure that the ADS/ENGINE probe heater switches on roof panel 4-211 are set to "OFF".

(c) Set ADC No.1 switch on panel 9-211 centre console to ON, check amber light illuminates.

(d) Push to test amber light, check that light goes out.

(e) Select test 1 on No.1 ADC rotary switch, panel 9-211 centre console; the amber light will illuminate and, after 3 seconds, the blue light will illuminate.

(f) Press the amber caption for 5 seconds to reset the ADC and check amber light goes out and blue light remains on.

R B (g) Check on panel 1-214 that secondary air door MI at 3CM station shows cross-hatched then "OPEN", operating time 5 to 7 seconds.

R B

R B (5) Set the No.1 control switch to "SHUT" check that the MI shows cross hatch, then "SHUT". Operating time 5 to 7 seconds.

(6) Reset ADC No.1 rotary switch to "NORM" and the control switch to "OFF". Remove the safety clips and reset the stick shaker circuit breaker previously tripped.

(7) Reset No.1 secondary air door control switch to "AUTO" - check that MI remains SHUT.

(8) Reset No 2, 3 and 4 secondary air door control switches to "AUTO".

C. Conclusion

(1) Switch off and disconnect electrical ground power (Ref.24-41-00).

4. Secondary Air Doors - Functional Test (Ref. Fig. 502)

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque limiting screwdriver range: 25-30 lbf in (0.29-0.34 mdaN)	-
Torque spanner range: 40-65 lbf in (0.45-0.73 mdaN)	-
Circuit breaker safety clips	-
Test set	TE.5101
Interphone equipment	-
Electrical power supply: 200V, 3 phase, 400 Hz with a fourth neutral wire	-

DESCRIPTION	PART NO.

B. Prepare

(1) Open the engine bay forward lower door (Ref. 71-00-00, Servicing).

(2) Trip the additional circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No.1			
R ENG 1 SEC AIR DOOR MTR SUP	2-213	1K247	C10
R ENG 1 SEC AIR DOOR POSN IND	1-213	1K238	F2
Engine No.2			
R ENG 2 SEC AIR DOOR MTR SUP	2-213	2K247	F10
R ENG 2 SEC AIR DOOR POSN IND	5-213	2K238	C3
Engine No.3			
R ENG 3 SEC AIR DOOR MTR SUP	4-213	3K247	A19
R ENG 3 SEC AIR DOOR POSN IND	5-213	3K238	C4
Engine No.4			
R ENG 4 SEC AIR DOOR MTR SUP	4-213	4K247	F19
R ENG 4 SEC AIR DOOR POSN IND	1-213	4K238	F3

(3) If access is required to the top secondary air door nearest the engine bay centrewall, remove the forward and aft intake rings (Ref. 71-21-11, Removal/Installation).

NOTE: An assessment of secondary air door clearances may be made on the two bottom doors without removing the intake rings.

(4) Connect the interphone. (Ref.23-41-00).

(5) Release the fasteners and open the No.1 motor access panel (411 NB).

C. Test (Ref. Fig. 503).

CAUTION: DO NOT OPERATE THE DOORS MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

(1) Connect the test set to the motor and indication switch unit:

(a) Disconnect the aircraft supply plugs to the secondary air door motor and the indication switch unit.

(b) Connect the MOTOR receptacle on the test set to the receptacle on the motor.

(c) Connect the INDICATION receptacle on the test set to the receptacle on the indication switch.

(d) Connect the SUPPLY receptacle on the test set to a 200V, 3 phase, 400 Hz supply with a fourth neutral wire.

(e) Check that the GO light is illuminated.

(2) Open the doors:

(a) Select "OPEN" on the MOTOR switch.

(b) Press the INCHING CONTROL button until the motor stops.

(c) Check that the doors open in 5 to 7 seconds.

(d) Check that the doors open fully without hesitation and that there is no tendency to stick.

(e) Check that the SHUT S/W light goes out and the OPEN S/W light illuminates.

(f) Check that the motor switches off correctly.

(3) Close the doors:

(a) Select "SHUT" on the MOTOR switch.

(b) Press the INCHING CONTROL button until the motor stops.

(c) Check that the doors close in 5 to 7 seconds.

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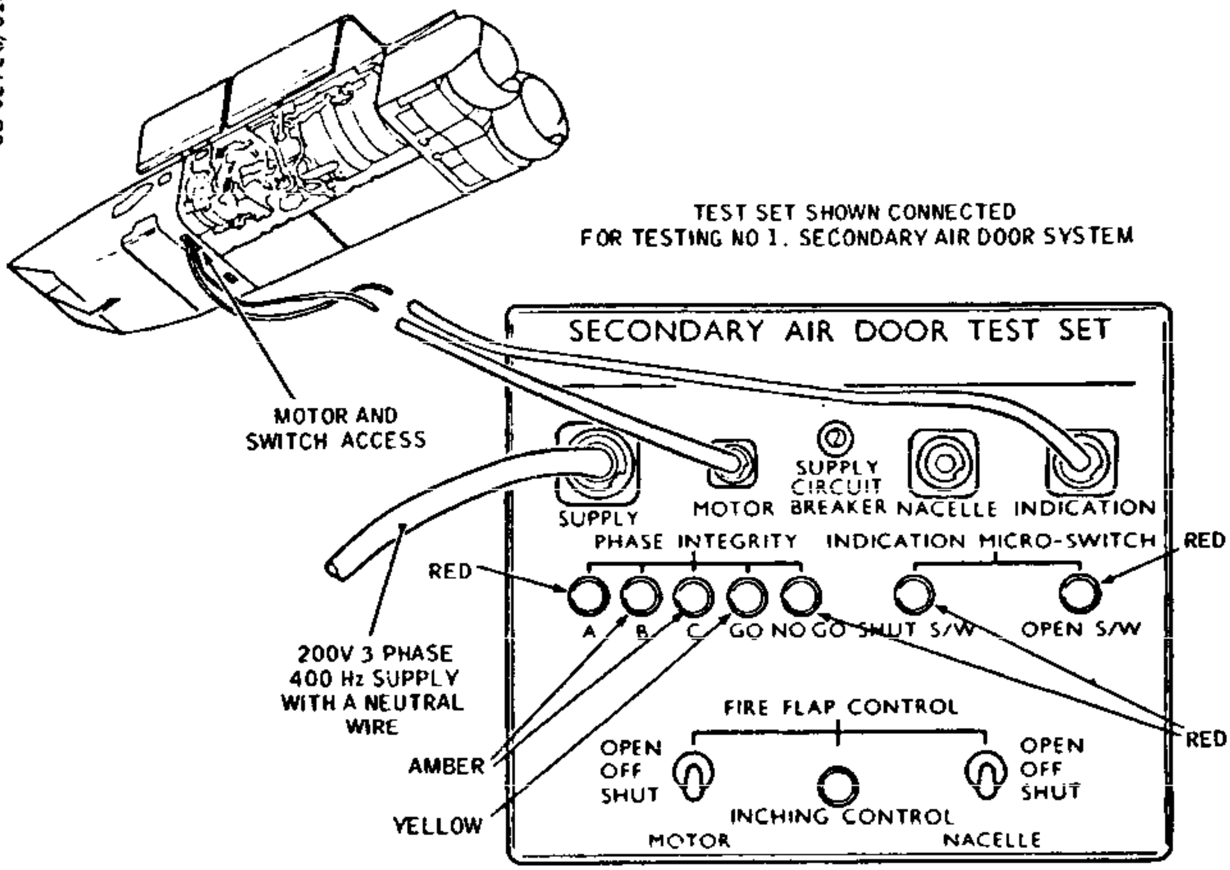

TEST SET CONNECTIONS

	MOTOR	INDICATION
ENGINE 1	CONNECT TO SEC. AIR DOOR MOTOR RECEPTACLE 1K250	CONNECT TO INDICATING SWITCH UNIT RECEPTACLE 1K257
ENGINE 2	CONNECT TO SEC. AIR DOOR MOTOR RECEPTACLE 2K250	CONNECT TO INDICATING SWITCH UNIT RECEPTACLE 2K257
ENGINE 3	CONNECT TO SEC. AIR DOOR MOTOR RECEPTACLE 3K250	CONNECT TO INDICATING SWITCH UNIT RECEPTACLE 3K257
ENGINE 4	CONNECT TO SEC. AIR DOOR MOTOR RECEPTACLE 4K250	CONNECT TO INDICATING SWITCH UNIT RECEPTACLE 4K257

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Secondary Air Doors - Test Set
Figure 503

(d) Check that the doors close without hesitation and that there is no tendency to stick.

(e) Check that the OPEN S/W light goes out and the SHUT S/W light illuminates.

(f) Check that the motor switches off correctly.

(4) Check and adjust if necessary the door clearances:

(a) On each bottom door, measure the gap between the aft face of the door and the aft face of the door sealing angle, which must not exceed the dimension engraved on the 'arrow'.

(b) When the gap is too large as after wear on the motor.

(b1) Disconnect the drive from the motor.

(b2) Turn the free end of the flexible drive shaft clockwise, in increments of one turn, a maximum of four revolutions.

(b3) Reconnect the drive.

(b4) Check at the point of the bottom door 'arrows', with a feeler gauge, and repeat the adjustment until the doors have returned to the datum shut setting.

(c) When there is no gap, and the doors have run onto the structure:

NOTE: When there is no clearance and the doors are in contact with the sealing angles, this is quite acceptable; if the doors can be just raised from its sealing angles by moderate hand pressure. If the door cannot be moved by moderate hand pressure, the following adjustments must be carried out.

(c1) Disconnect the drive from the motor.

(c2) Turn the free end of the flexible drive shaft anti-clockwise until the doors return to the datum shut setting.

(c3) Reconnect the drive.

(c4) Check at the point of the bottom door 'arrows', with a feeler gauge, to establish that the clearance does not exceed the dimension engraved on the doors.

(5) Check that the flexible drive shaft is engaged with the motor and screwjack.

NOTE: Ensure that the centre core of the flexible drive remains engaged with the equipment during installation as shown in Detail E. (Ref. Fig. 501)

(6) Tighten the shaft nut to between 40 and 65 lbf in (0.45 and 0.73 mdaN) and lock the drive shaft with wire.

D. Conclusion

(1) Disconnect the test set and reconnect the aircraft electrical cables ensuring that the connections are made in accordance with the connector identifications.

(a) Disconnect the test set from the indication switch and motor.

(b) Connect the aircraft electrical connector to the indication switch and motor.

(2) Remove the safety clips and reset the circuit breakers previously tripped.

(3) Check that the aircraft is clean and carry out an operational test of the secondary air doors (Ref. para 3).

(4) Close and lock the motor access panel. Torque-tighten each fastener to 25-30 lbf in (0.29-0.34 mdaN).

(5) Remove the interphone. (Ref.23-41-00).

(6) If necessary, reconnect the forward and aft intake rings (Ref.71-21-11).

(7) Check that the area is clean, close and lock the engine bay door (Ref.71-00-00, Servicing).

5. Fire Flaps - Operational Test (Ref. Fig.501 and 502)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Interphone equipment	-

B. Preparation

WARNING: ENSURE THAT THE AREA IN THE VICINITY OF THE SECONDARY AIR DOORS AND THE ENGINE BAY VENTILATION FLAP IS CLEAR OF PERSONNEL AND EQUIPMENT.

(1) Check that the No.1 engine shut-down handle (emergency only) is in the fully-in (reset) position.

(2) Isolate the services associated with the No.1 engine shut-down handle, with the exception of the fire-flaps, (Ref.26-22-00).

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Establish communication between the 3CM position and the engine bay.

(5) Set No.1 secondary air door control switch, on the power management panel to "OPEN".

(6) Check that No.1 MI shows diagonal stripes, then "OPEN".

C. Test

CAUTION: DO NOT OPERATE THE FIRE FLAPS MORE THAN ONE CYCLE OF OPERATION IN TWO MINUTES.

(1) Pull the No.1 engine shut-down handle, on the fire control panel (4-211) and check that:

(a) After a short period (5 to 7 seconds approximately) the FIRE FLAPS green caption illuminates.

(b) That the magnetic indicator for the secondary

air doors on panel 1-214 shows "SHUT".

(c) That the engine bay ventilation flap on the engine bay forward door is shut.

(2) Reset the No.1 engine shut-down handle and check that:

(a) The FIRE FLAPS caption goes out.

(b) The engine bay ventilation flap on the engine bay forward door opens.

(c) The magnetic indicator for the secondary air doors on the power management panel (1-214) shows OPEN.

(3) Set the secondary air door switch on the power management panel to "SHUT" and check that the MI shows diagonal stripes, then "SHUT".

D. Conclusion

(1) Switch off and disconnect electrical ground power (Ref.24-41-00).

(2) Restore the services associated with No.1 engine shut-down handle which were previously isolated (Ref.26-22-00).

(3) Remove the safety clips and reset the circuit breakers previously tripped.

(4) Remove the interphone equipment.

FIRE FLAPS - (SECONDARY AIR DOORS AND ENGINE BAY VENTILATION FLAP) - CLEANING/PAINTING

WARNING: THE SECONDARY AIR DOORS MUST BE ELECTRICALLY ISOLATED WHEN RESTORING DAMAGED PAINTWORK.

1. General (Ref. Fig. 701)

R Parts of the rear surfaces of the secondary air doors, the door hinge brackets and the surrounding areas on the bulkhead, are covered with intumescent paint which is applied on a prepared surface of Viton. To ensure even coverage, the paint is applied in coats using alternate colours.

R
R When exposed to high heat or flame, the paint swells to assist in the sealing of the secondary air doors, in the event of an engine bay fire. Damage to the paint can be caused mechanically, or by overheating. Existing paint boundaries which remain identifiable, must not be extended when repainting.

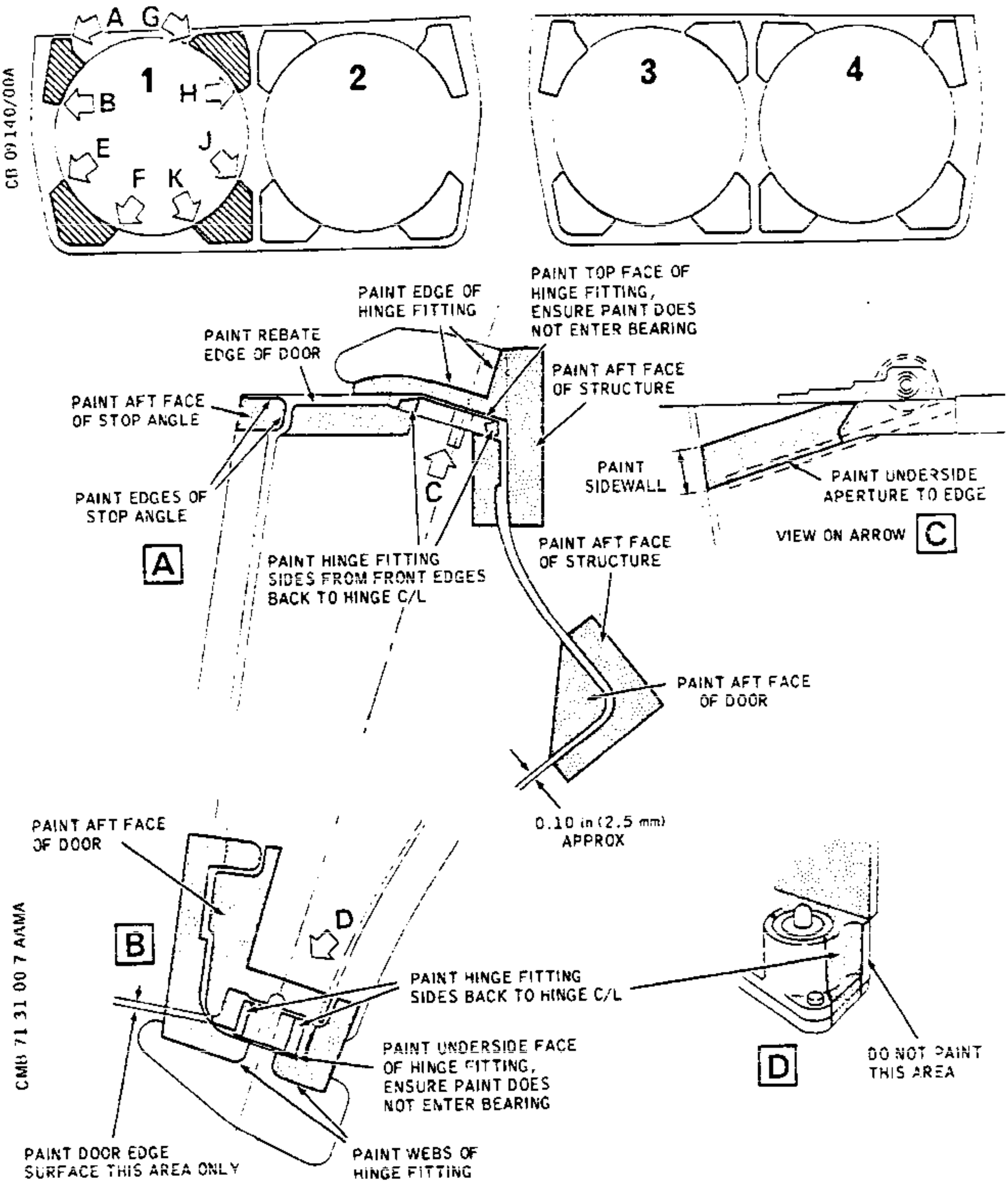
2. Painting

A. Equipment and Materials

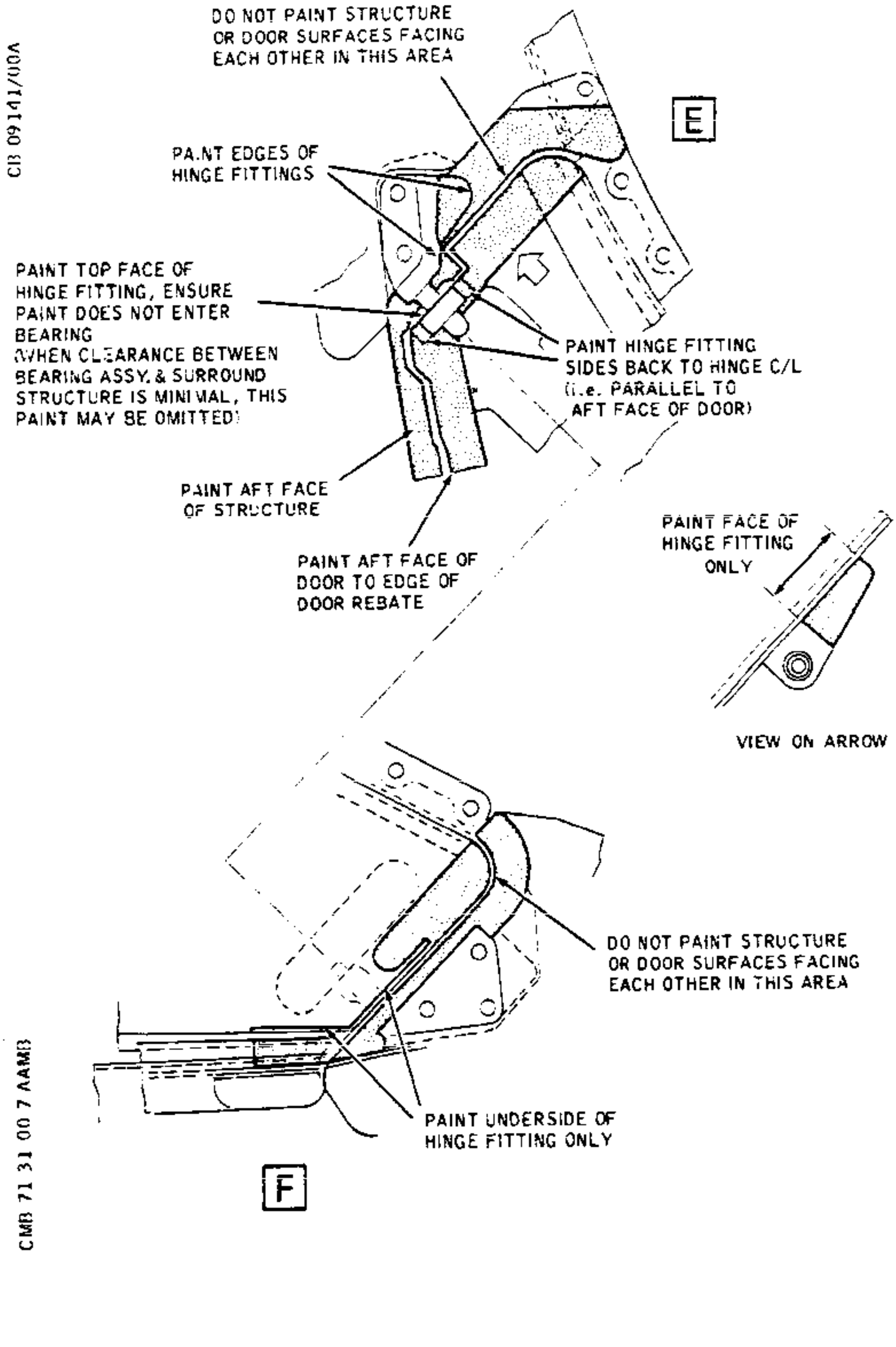
DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Clean lint free cloths	-
Self-adhesive masking tape	-
Hard-bristle brush	-
Abrasive paper, Scotchbrite grade 'S' fine (Ref.20-30-00, No.458) (R)	-
Vacuum cleaner	-
Solvent, (Ref.20-30-00, No.473) (R)	BACM302
Soft-haired paint brush	

B. Prepare

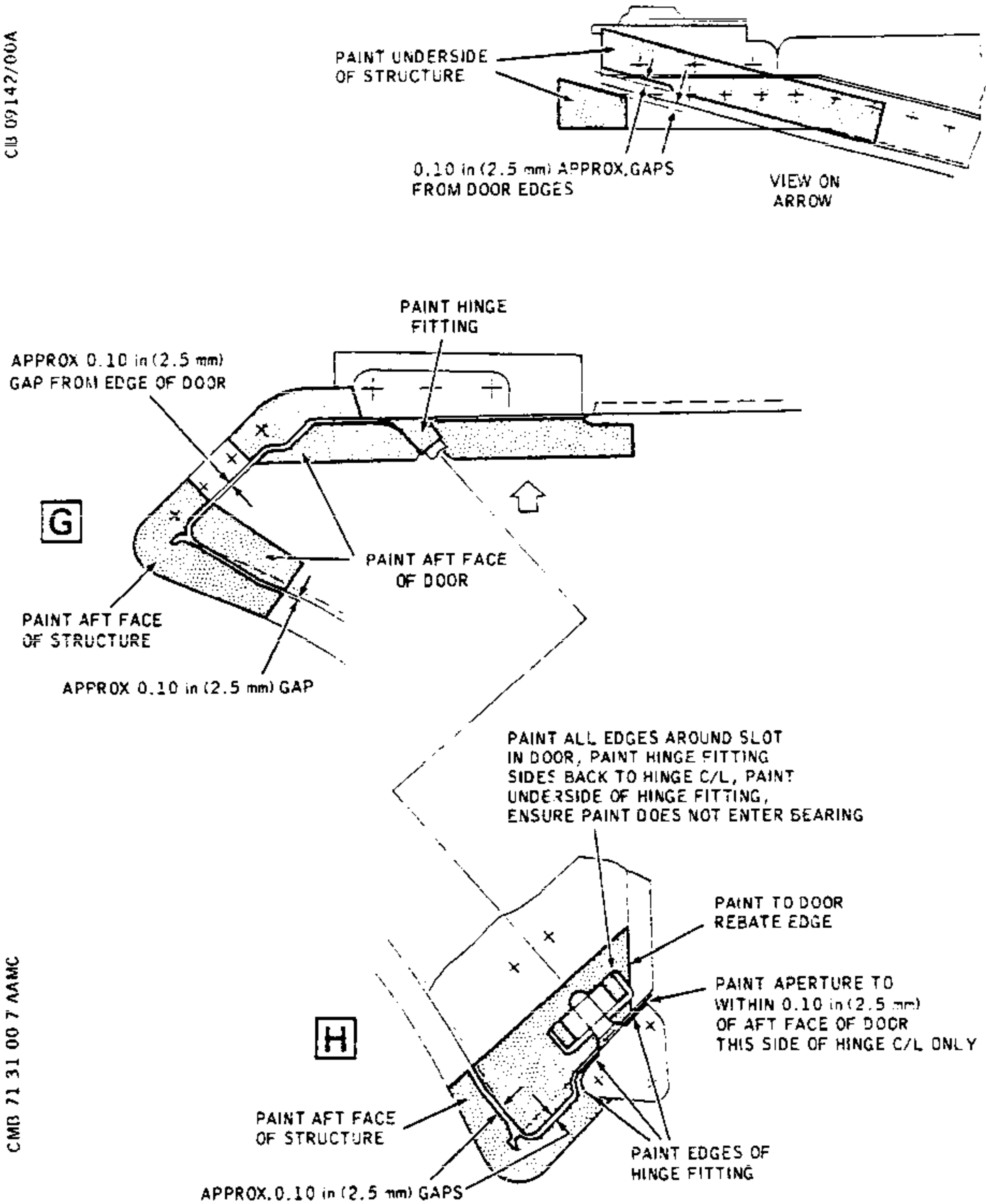
(1) Open the secondary air doors (Ref. 71-31-00,



Secondary Air Doors - Areas Coated With
Intumescent Paint (Sheet 1 of 4)
Figure 701



Secondary Air Doors - Areas Coated With Intumescent Paint (Sheet 2 of 4)
Figure 701



Secondary Air Doors - Areas Coated With
Intumescent Paint (Sheet 3 of 4)
Figure 701

R

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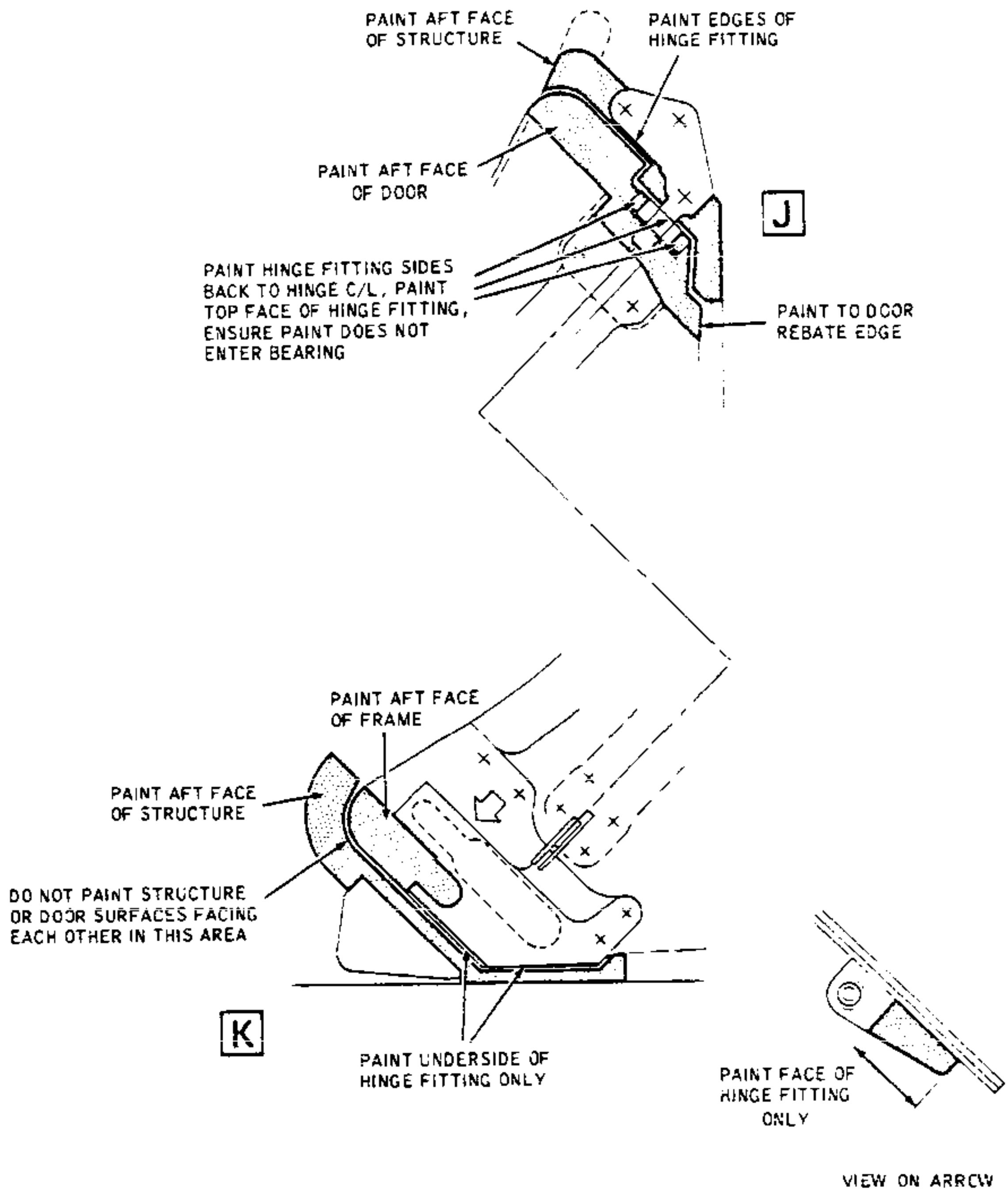

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Secondary Air Doors - Areas Coated With
Intumescent Paint (Sheet 4 of 4)
Figure 701

R

Servicing).

(2) Open the engine bay forward access door (Ref. 71-00-00, Servicing).

R (3) If repainting is required on the secondary air doors positioned at the centrewall, then remove the intake rings (Ref. 71-21-11, Removal/Installation).

R
R (4) Prepare damaged areas of intumescent paint for repainting on titanium surface (Ref.20-24-22).

R
R (5) When a new door is to be fitted, mark out the areas to be painted (Ref. Fig. 701) and prepare the titanium surface for painting (Ref.20-24-22).

R
R NOTE: The purpose of the paint is, in the event of fire, to seal gaps in the structure around the hinge areas of the secondary air doors. The width of paint strip that can be applied is, in some places, limited by the confines of the structure. Where there is no such restriction, a strip width of approximately 0.75 in (19 mm) is sufficient.

C. Paint

(1) Check that the spherical bearings are adequately masked.

(2) Apply intumescent paint to the required areas, (Ref. 20-24-22).

CAUTION: DO NOT ALLOW THE SOLVENT OR PAINT TO COME IN CONTACT WITH DOOR BEARINGS OR ANY NON-METALLIC PARTS, OR SURFACES IN CONTACT WITH SEALS, FIREWIRES, ELECTRIC CABLE, ARMOUR PLATE AND UNPAINTED STAINLESS STEEL HEATSHIELDS.

(3) Remove the masking tape and thoroughly clean the surrounding area.

D. Conclusion

(1) Check that the electrical safety precautions, that were taken before painting, are complied with.

R
R
R (2) Close the secondary air doors (Ref.71-31-00, Servicing), ensuring that the freshly painted areas do not prevent complete closure of the

doors.

R (3) Refit the intake rings, if previously removed (Ref. 71-21-11, Removal/Installation).

R (4) Close the engine bay forward access door
R Ref.71-00-00, Servicing).

ENGINE BAY VENTILATION FLAP AND ACTUATOR - REMOVAL/ INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS IN 24-00-00.

1. General

The engine bay ventilation flaps are incorporated in the engine bay forward doors and are spring biased in the open position until positive air pressure in the engine bay closes them. Operation of the relevant engine shut-down handle closes the flap by means of an electrical actuator. The engine bay forward door must be opened to gain access to the flap and actuator.

2. Engine Bay Ventilation Flap

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Torque spanners range:	
30-40 lbf in (0.34 and 0.45 mdaN)	-
R 60-70 lbf in (0.68 and 0.79 mdaN)	-

B. Prepare to Remove Flap

(1) Open the engine bay doors to the servicing position (Ref. 71-00-00, Servicing).

R (2) Trip the following additional circuit breakers and fit safety clips.

	SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
	Engine No.1			
R	ENG 1 SHUT DOWN CONT	3-213	1K253	F3
R	ENG 1 SEC AIR DOOR POSN IND	1-213	1K238	F2
	Engine No.2			
R	ENG 2 SHUT DOWN CONT	1-213	2K253	D1
R	ENG 2 SEC AIR DOOR POSN IND	5-213	2K238	C3

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No.3			
R ENG 3 SHUT DOWN CONT	1-213	3K253	D2
R ENG 3 SEC AIR DOOR POSN IND	5-213	3K238	C4
Engine No.4			
R ENG 4 SHUT DOWN CONT	3-213	4K253	F4
R ENG 4 SEC AIR DOOR POSN IND	1-213	4K238	F3

C. Remove Flap (Ref. Fig. 401)

(1) Support the actuator and remove the bolt securing the actuator eye-end to the thrust lever.

(2) Restrain the end of the spring that abuts the retaining spigot, and remove the nut and retaining spigot; release the spring.

(3) Support the flap and remove the shouldered bolt and hinge bolt from the brackets; remove the flap and the spring.

D. Install Flap (Ref. Fig. 401)

(1) Comply with the electrical safety precautions.

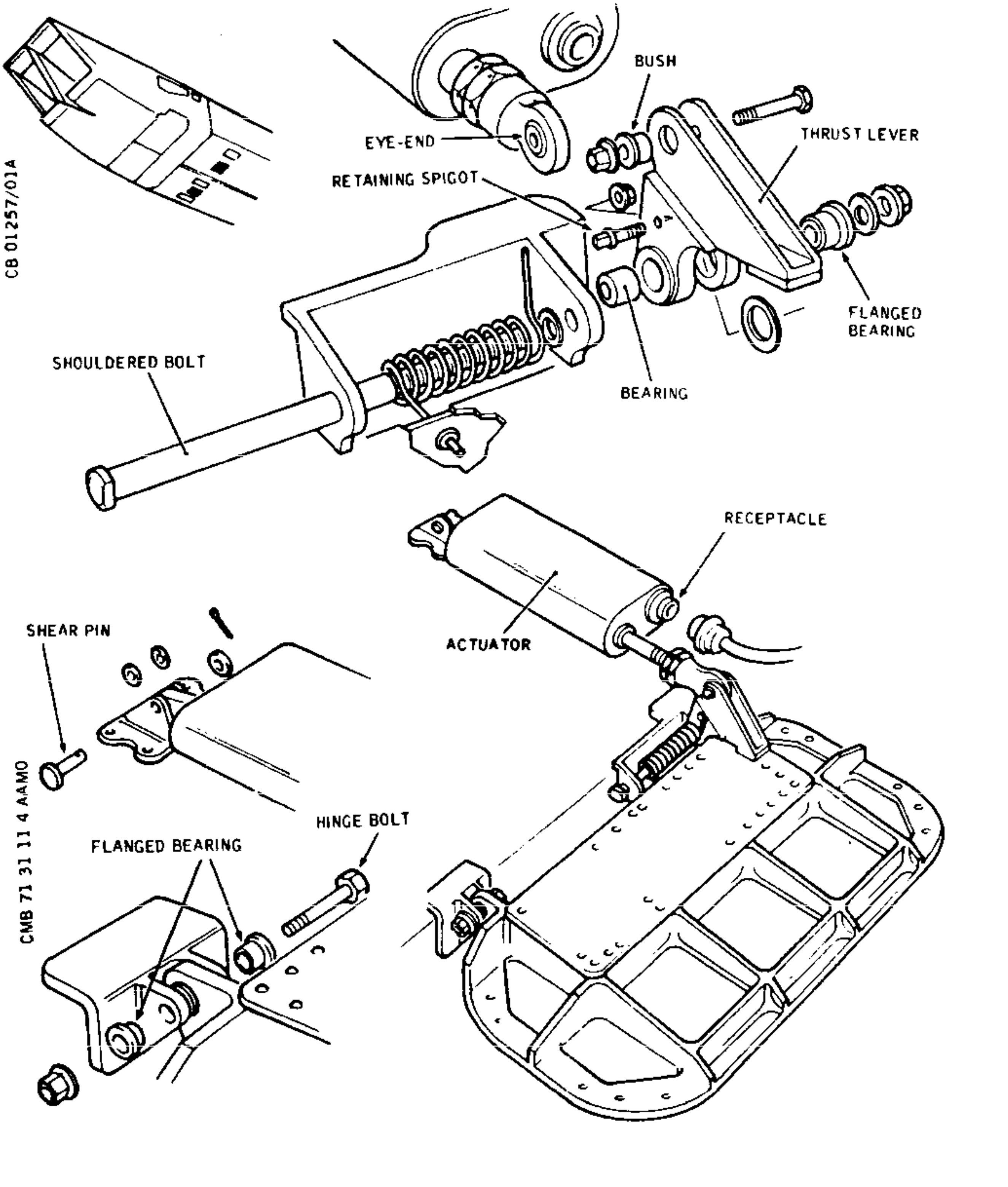
(2) Engage one leg of the spring with the bush in the forward edge of the flap, align the spring with the shouldered bolt holes, and partially fit the bolt to retain the spring in position.

(3) Support the flap in position and secure:

(a) At the hinge bolt with two flanged bearings and a bolt and a nut.

(b) At the shouldered bolt with a spring, washer, bearing, washer, flanged bearing, washer and nut.

R (c) Torque-tighten the hinge bolt to between 30 and 40 lbf in (0.34 and 0.45 mdaN) and the
R shouldered bolt to between 60 and 70 lbf in
R (0.68 and 0.79 mdaN).



Engine Bay Ventilation Flap Actuator - Installation
Figure 401

(4) Position the right hand leg of the spring rearward of the retaining spigot hole and fit the spigot and nut. Torque-tighten the nut to between 30 and 40 lbf in (0.34 and 0.45 mdaN). Check that when the flap is closed and then released, the spring returns the flap to the open position.

NOTE: The torque load of the spring is
R approximately 22 lbf in (0.25 mdaN).

(5) Engage the actuator eye-end with the thrust lever and secure the assembly with a bolt, bush and a nut. Torque -tighten the nut to between 30 and 40 lbf in (0.34 and 0.45 mdaN).

(6) Carry out a mechanical check on the flap (Ref. 71-31-11, Adjustment/Test).

E. Conclusion

(1) Close the engine bay forward door (Ref. 71-00-00, Servicing).

(2) Remove the safety clips and reset the circuit breakers previously tripped.

(3) Operationally test the fire flap system (Ref. 71-31-00, Adjustment/Test) checking the operation of the ventilation flap.

3. Actuator

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breakers safety clips	-
Torque spanner range: 30-40 lbf in (0.34 and 0.45 mdaN)	-
Corrosion resistant steel wire 0.31 in (0.8 mm) dia.	DTD189

B. Prepare to Remove Actuator

(1) Open the engine bay forward door (Ref. 71-00-00,

Servicing).

R (2) Trip the following additional circuit breakers and
R fit safety clips:

	SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
	Engine No.1			
R	ENG 1 SHUT DOWN CONT	3-213	1K253	F3
R	ENG 1 SEC AIR DOOR POSN IND	1-213	1K238	F2
	Engine No.2			
R	ENG 2 SHUT DOWN CONT	1-213	2K253	D1
R	ENG 2 SEC AIR DOOR POSN IND	5-213	2K238	C3
	Engine No.3			
R	ENG 3 SHUT DOWN CONT	1-213	3K253	D2
R	ENG 3 SEC AIR POSN IND	5-213	3K238	C4
	Engine No.4			
R	ENG 4 SHUT DOWN CONT	3-213	4K253	F4
R	ENG 4 SEC AIR DOOR POSN IND	1-213	4K238	F3

C. Remove Actuator (Ref. Fig. 401)

R (1) Remove the electrical connector from the actuator.

(2) Remove the bolt securing the actuator eye-end to the thrust lever.

(3) Support the actuator and remove the shear pin securing it to the mounting; remove the actuator.

D. Install Actuator

<u>NOTE</u>: If a replacement actuator is fitted, adjust it in accordance with 71-31-11, Adjustment/Test.

(1) Comply with the electrical safety precautions.

(2) Secure the actuator to the mounting in the door with a shear pin, washer and split pin. Ensure that the actuator pivots freely.

(3) Engage the actuator eye-end with the lever and
R secure it with a bolt, bush and nut. Torque-tighten

the nut to between 30 and 40 lbf in (0.34 and 0.45 mdaN).

R (4) Connect the electrical connector to the actuator
R ensuring that the mating surfaces are clean and
R undamaged. Wire-lock the çonnector in accordance
R with 20-21-13.

E. Conclusion

(1) Close the engine bay forward door (Ref. 71-00-00, Servicing).

(2) Remove the safety clips and reset the circuit breakers previously tripped.

(3) Functionally test the fire flap system (Ref. 71-31-11, Adjustment/Test) checking the operation of the engine bay ventilation flap.

ENGINE BAY VENTILATION FLAP AND ACTUATOR - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS IN 24-00-00.

1. General

R This topic describes the actuator adjustment and mechanical
R test for No. 1 engine bay ventilation flap. The procedure
R for engine bays 2, 3 and 4 is similar. The actuator is
R tested as part of the fireflaps system (Ref. 71-31-00,
R Adjustment/Test).

2. Actuator Adjustment

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Corrosion resistant steel wire 0.031 in (0.8 mm) dia. (R)	DTD 189
28V d.c. ground power supply	-
Torque spanner range: 30-40 lbf in (0.34 and 0.45 mdaN)	-
Torque spanner 100 lbf in (1.13 mdaN) (R)	-

B. Prepare

R (1) Open the No. 1 engine bay forward access
R door (Ref. 71-00-00, Servicing).

R (2) Trip the following appropriate circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No.1			
ENG 1 SHUT DOWN CONT	3-213	1K253	F3
ENG 1 SEC AIR DOOR POSN IND	1-213	1K238	F2
Engine No. 2			
ENG 2 SHUT DOWN CONT	1-213	2K253	D1
ENG 2 SEC AIR DOOR POSN IND	5-213	2K238	C3
Engine No.3			
ENG 3 SHUT DOWN CONT	1-213	3K253	D2
ENG 3 SEC AIR DOOR POSN IND	5-213	3K238	C4
Engine No. 4			
ENG 4 SHUT DOWN CONT	3-213	4K253	F4
ENG 4 SEC AIR DOOR POSN IND	1-213	4K238	F3

C. Adjust (Ref. Fig. 501)

(1) Remove the bolt securing the actuator ram eye-end to the thrust lever.

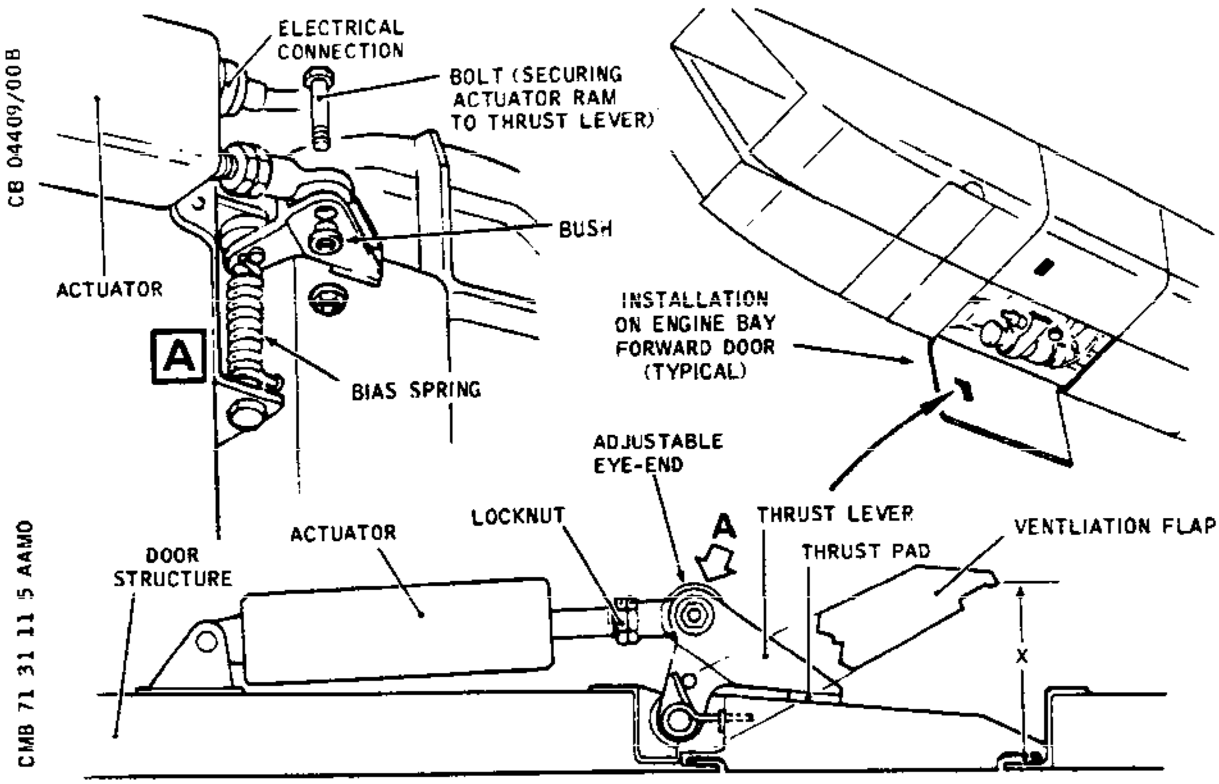
(2) Disconnect the electrical connector from the actuator and connect a 28V d.c. ground power supply, in its place (Ref. Fig. 502).

NOTE: If no 28V d.c. ground supply is available, isolate the services associated with the No.1 ESDH, with the exception of the fire flaps (Ref.26-22-00). When following this procedure, omit operations (2), (11) and (12).

(3) Using the 28V d.c. supply, fully extend the actuator.

(4) Remove the locking wire from the actuator eye-end and slacken the locknut.

(5) Hold the ventilation flap closed by pressing on the lever and pad, so that the outer surface of the ventilation flap is parallel with the outer surface of the engine bay door.



Engine Bay Ventilation Flap and Actuator - Adjustment
R Figure 501

R (6) Adjust the eye-end of the actuator ram to line up
R with the hole in the thrust lever, hand-tighten the
R eye-end locknut.

R (7) Reconnect the actuator eye-end to the thrust lever
R by fitting the bolt, bush and nut. Hand-tighten the
R nut.

R (8) Fully retract the actuator and check that dimension
R X(Ref. Fig. 501) is between 4.20 and 4.35 in
R (106.68 and 110.49 mm).

R (9) Torque-tighten the nut on the bolt connecting the
R actuator eye-end to the thrust lever to between 35
R and 40 lbf in (0.34 and 0.45 mdaN).

R (10) Torque-tighten the actuator eye-end locknut to 100
R lbf in (1.13 mdaN) and wire-lock in accordance with
R 20-21-13.

R (11) Switch off and disconnect the 28V d.c. ground

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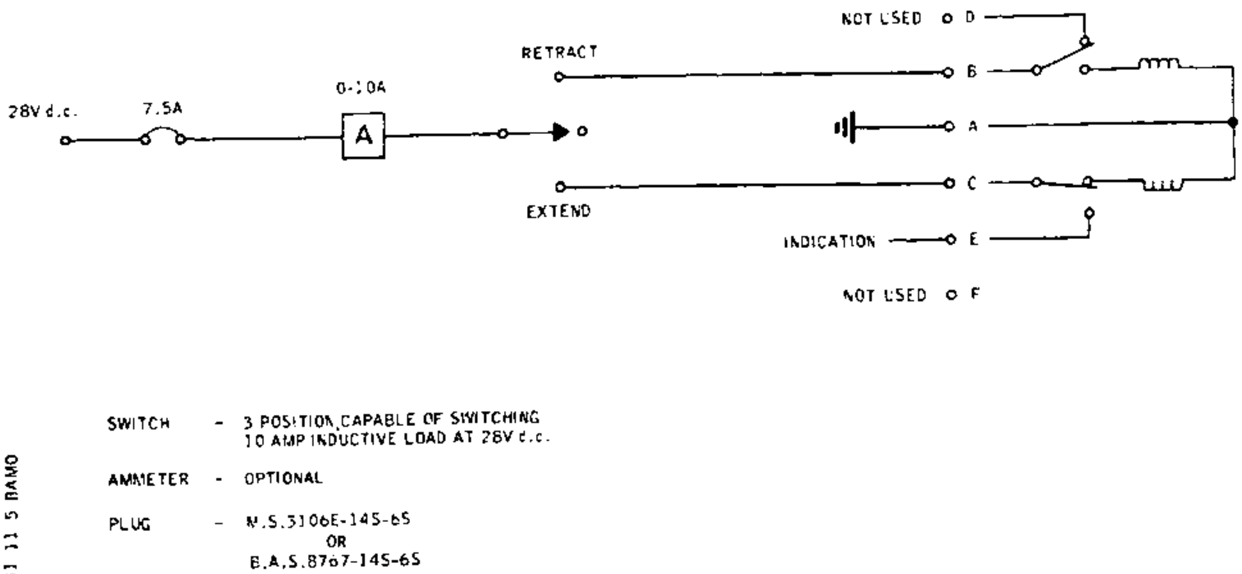

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28V d.c. Connection - Schematic
Figure 502

R power supply.

R (12) Reconnect the electrical connector to the actuator
R ensuring that the mating surfaces are clean and
R undamaged.

R (13) Carry out the mechanical test (Ref. para.3).

D. Conclusion

(1) Close and lock the engine bay forward door (Ref. 71-00-00, Servicing).

(2) Remove the safety clips and reset the circuit breakers previously tripped.

(3) Functionally test the fire flaps system (Ref. 71-31-00, Adjustment/Test).

3. Engine Bay Ventilation Flap - Mechanical Test

A. Equipment and Materials.

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare

(1) Carry out the preparation procedure
R (Ref. Para.2.B.).

C. Test

(1) Push the ventilation flap closed against spring pressure:

(a) Check that the flap moves freely.

(b) Check that the flap seats flush against the flap landing on the door.

D. Conclusion

R (1) Carry out the conclusion procedure (Ref. Para.2.D.).

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SECONDARY AIR DOORS - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General (Ref. Fig. 401)

Sixteen secondary air doors (four per engine bay)are hinged on the aft face of the fireproof bulkheads at the rear of the engine air intakes. The top outboard door of each nacelle installation (doors 9, 10, 15 and 16) is attached to an actuator by a bracket on its forward face. The other doors have a slot in them through which an actuator shaft protrudes, to be attached to a hinge bracket on the aft face of the door.

The secondary air doors are accessible with the engine bay forward doors open, but each top door nearest the engine bay centre wall, requires the removal of the air intake transition rings to gain access (Ref.71-21-11). These procedures describe the removal and installation of the doors in three separate groups.

R B NOTE: All secondary air door hinge bearings are PTFE lined and
R B consequently must never be lubricated. Hinge bearings may
R B occasionally be found stiff or seized, probably caused by
R B the ingress of hydraulic fluid from leaking ramp actuators
R B but possibly the result of previous lubrication.

R B CHECK HINGE BEARINGS for free movement by disconnecting
R B the screw jack eye-end at the door attachment and move the
R B door through its full travel in both directions. Repeat
R B for each secondary air door. Moderate arm force to
R B achieve door movement is acceptable, but if excessive
R B effort is required, or if movement is jerky or incomplete
R B then the door must be replaced or the responsible hinge
R B bearing(s) renewed. DO NOT LUBRICATE.

2. Doors (Nos. 1 to 8)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

DESCRIPTION	PART NO.
Torque spanner range:	
25-30 lbf in (0.28-0.34 mdaN)	-
60-70 lbf in (0.67-0.78 mdaN)	-
70-80 lbf in (0.78-0.89 mdaN)	-
140-160 lbf in (1.58 and 1.81 mdaN)	-
Interphone equipment	-
Viton sealant (Ref. 20-30-00, No. 351)	-

B. Prepare to remove Doors

(1) Open the engine bay forward door (Ref. 71-00-00, Servicing).

(2) Trip the following additional circuit breakers and secure them with safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No.1			
SEC. AIR DOOR MTR. SUP	2-213	1K247	C10
SEC. AIR DOOR POSN. IND	1-213	1K238	F 2
Engine No.2			
SEC. AIR DOOR MTR. SUP	2-213	2K247	F10
SEC. AIR DOOR POSN. IND	5-213	2K238	C 3
Engine No.3			
SEC. AIR DOOR MTR. SUP	4-213	3K247	A19
SEC. AIR DOOR POSN. IND	5-213	3K238	C 4

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No.4			
SEC. AIR DOOR MTR. SUP	4-213	4K247	F19
SEC. AIR DOOR POSN. IND	1-213	4K238	F 3

C. Remove Doors (Ref. Fig. 401)

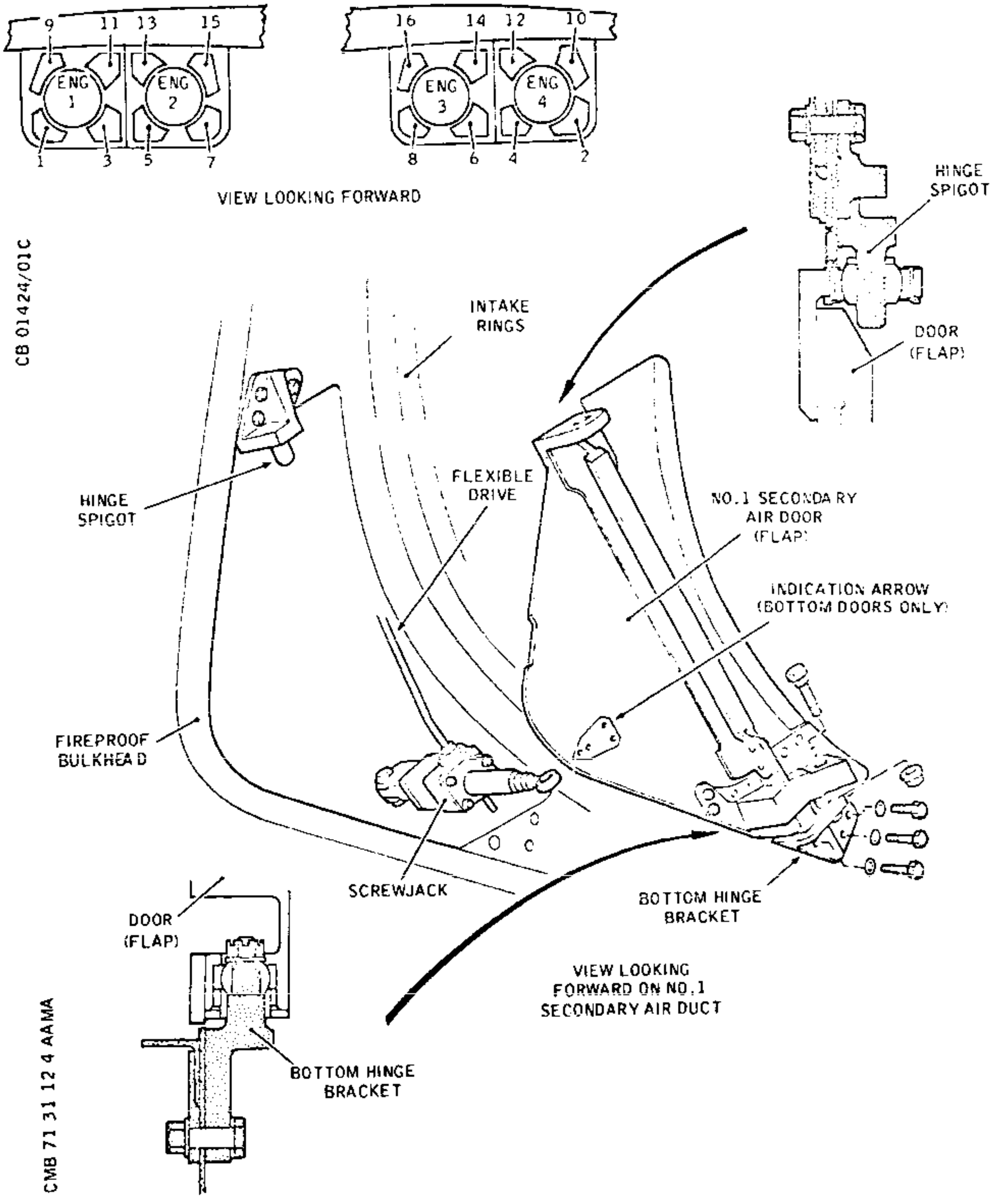
(1) Strip the Viton covering from the nut; remove the nut, washer and bolt, securing the screwjack eye-end to the door.

(2) Strip the Viton covering from the nuts and remove the three bolts securing the bottom hinge bracket to the fireproof bulkhead; support the door.

(3) Withdraw the door and hinge bracket from the hinge spigot.

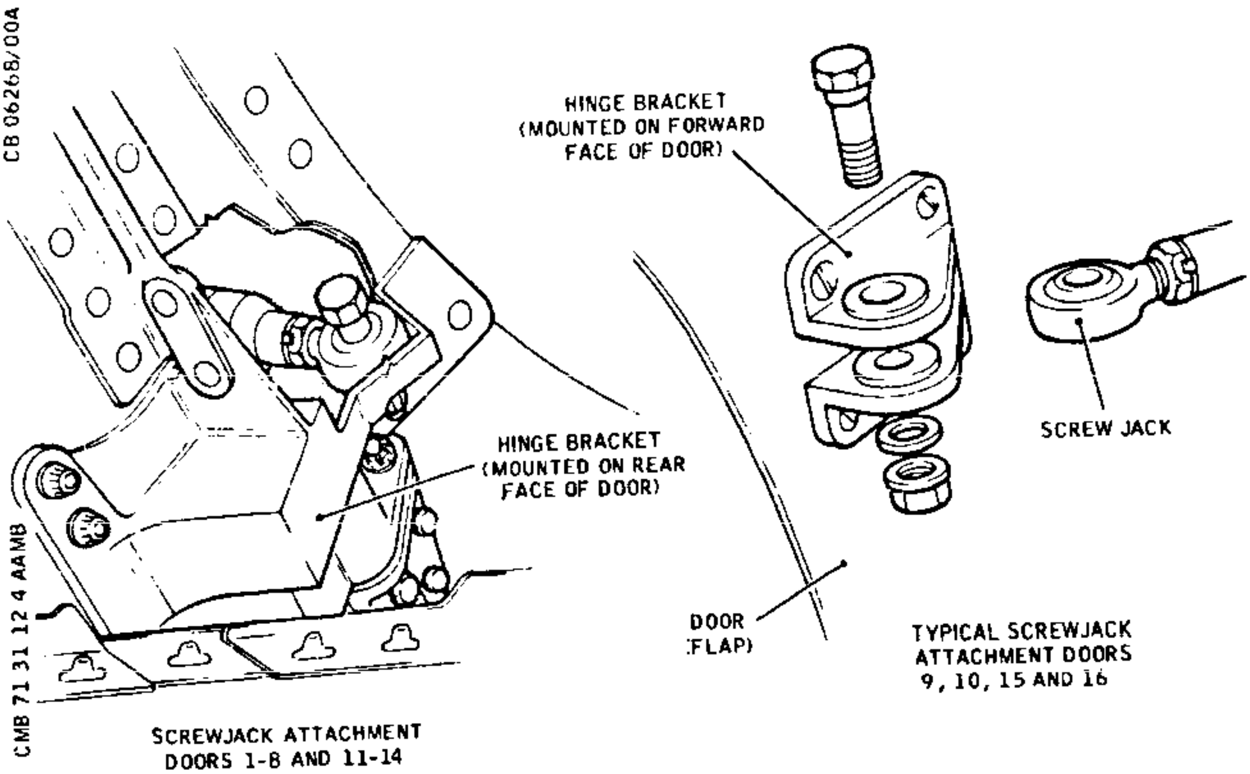
D. Prepare to Install Door (Ref. Fig. 402 and 403)

(1) Comply with the electrical safety precautions.



Secondary Air Doors-Installation (Sheet 1 of 2)
Figure 401

R



Secondary Air Doors-Installation (Sheet 2 of 2)
R Figure 401

(2) When a new door is to be fitted:

(a) Mark out and drill holes as required in the replacement door.

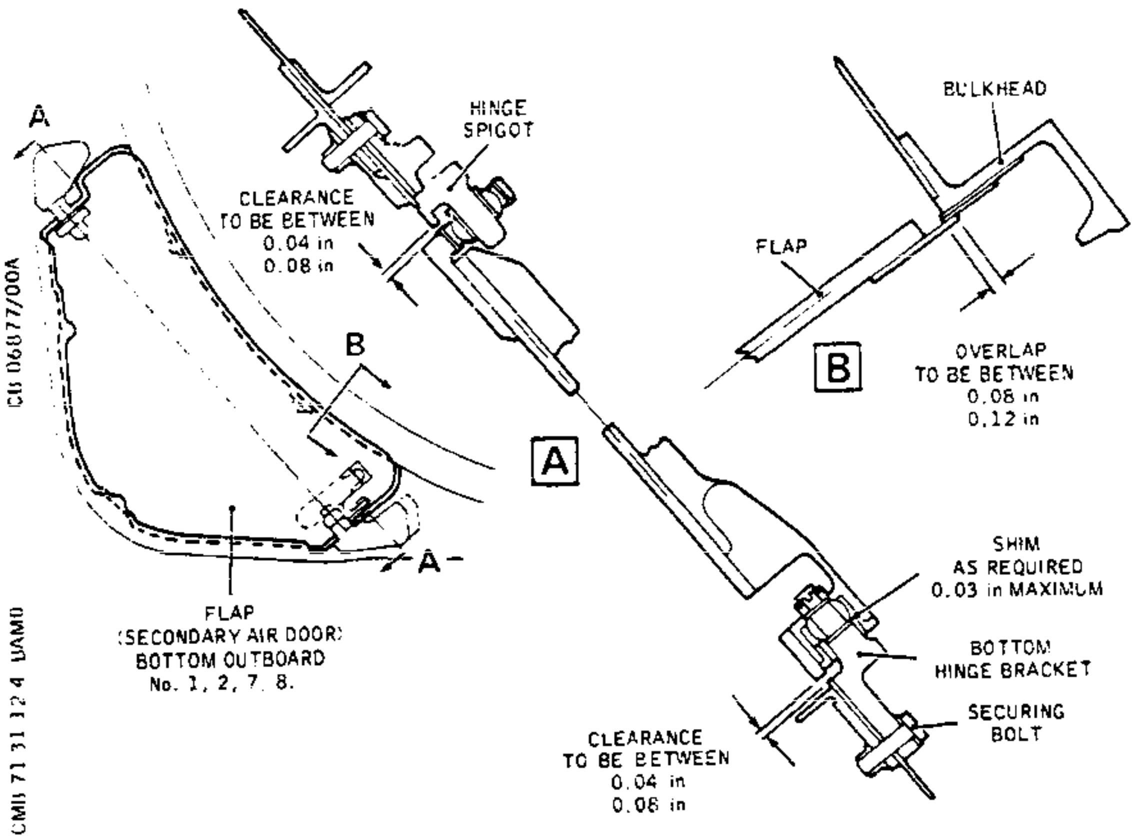
(b) Apply surface treatment, primer and intumescent paint (Ref.71-31-00, Cleaning/Painting).

(c) Remove the split pin, nut and washer securing the bottom hinge bracket to the existing door; retain
R the shim set. Alternatively, when fitting a new
R hinge bracket, drill the undrilled holes as
R required.

(d) Engage the hinge bracket and shims with the new door and secure it with a washer and nut.

NOTE: The new door may require more or less shims.

(e) Temporarily install the door, secure the hinge bracket to the bulkhead and check the top and



Door Clearances, for a New Installation
Figure 402

R

bottom door clearances; these are to be between 0.080 and 0.040 in (2.0-1.0 mm) for door No. 1. Shim if necessary to a maximum of 0.030 in (0.76 mm).

(f) Check the door overlap is within the limits defined in the illustration.

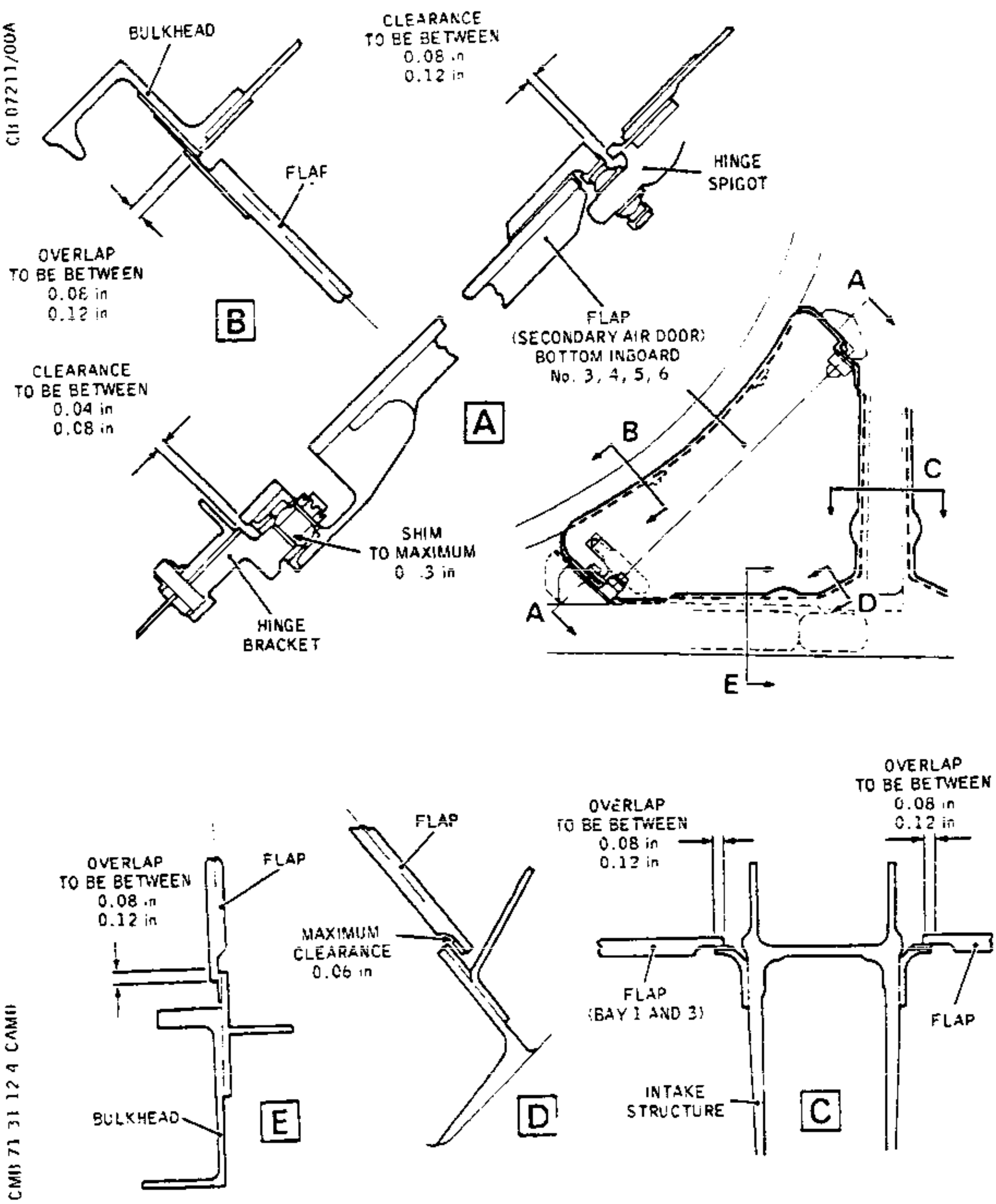
(g) Torque load the hinge bracket nut to between 25 and 30 lbf in (0.28 and 0.34 mdaN) and lock it with a split pin.

(h) Check during full travel of the door that the minimum gap between the door edge and any cascade structure is 0.15 in (3.81mm).

E. Install Door (Ref. Fig. 401)

NOTE: Torque load bolts (Ref. 20-21-11).

Wirelock nuts and bolts (Ref.20-21-13).



Door Clearances, for a New Installation
Figure 403

R

Encapsulate nuts and bolts in Viton (Ref. 20-22-19).

(1) Engage the door on the spigot.

(2) Align the holes in the hinge bracket with the holes in the bulkhead and in the anchor-nut plate and secure the door with the three bolts and washers.

(3) Torque load each of the two smaller diameter bolts to between 70 and 80 lbf in (0.78 and 0.89 mdaN).

(4) Torque load the larger diameter bolt to between 140 and 160 lbf in (1.58 and 1.81 mdaN).

(5) Secure the screwjack to the door with the bolt, washer and nut. Torque load the nut to between 50 and 60 lbf in (0.56 and 0.67 mdaN).

F. Conclusion.

(1) Remove the safety clips and set the additional circuit breakers tripped in sub-paragraph 2.B.(2).

R (2) Adjust and test the doors (Ref. 71-31-00, Adjustment/Test).

(3) Encapsulate the nuts in Viton (Ref. 20-22-19).

(4) Close the engine bay forward doors (Ref. 71-00-00, Servicing).

3. Doors (Nos. 11, 12, 13 and 14) (Ref. Fig. 404)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Torque spanner range: 25-30 lbf in (0.28-0.34 mdaN) 40-45 lbf in (0.45-0.51 mdaN) 50-60 lbf in (0.56-0.67 mdaN)	-

DESCRIPTION	PART NO.
Interphone equipment	-
Viton sealant (Ref. 20-30-00, No 351)	-

B. Prepare to Remove Doors.

(1) Open the engine bay forward door (Ref. 71-00-00, Servicing).

(2) Trip the following additional circuit breakers and secure them with safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No.1			
SEC. AIR DOOR MTR. SUP	2-213	1K247	C10
SEC. AIR DOOR POSN. IND	1-213	1K238	F 2
Engine No.2			
SEC. AIR DOOR MTR. SUP	2-213	2K247	F10
SEC. AIR DOOR POSN. IND	5-213	2K238	C 3
Engine No.3			
SEC. AIR DOOR MTR. SUP	4-213	3K247	A19
SEC. AIR DOOR POSN. IND	5-213	3K238	C 4
Engine No.4			
SEC. AIR DOOR MTR. SUP	4-213	4K247	F19
SEC. AIR DOOR POSN. IND	1-213	4K238	F 3

(3) Remove the intake rings (Ref. 71-21-11, Removal/ Installation).

C. Remove Doors (Ref. Fig. 404)

(1) At the door top hinge bracket, remove the split pin nut and washer from the pivot pin.

(2) Remove the bolt securing the jack ram to the door.

(3) Remove the three bolts securing the bottom spigot bracket; remove the door. Retain the shims on the top hinge pivot.

D. Prepare to Install Door (Ref. Fig. 404)

(1) Comply with the electrical safety precautions.

(2) When a new door is to be fitted (Ref. Fig. 404)

(a) Trim the edge of the replacement door to suit the the existing structure.

(b) Apply surface treatment, primer and intumescent paint (Ref.71-31-00, Cleaning/Painting).

(c) Remove the spigot bracket from the existing
R door. Alternatively, when fitting a new hinge
R bracket, drill the undrilled holes as required.

(d) Engage the spigot bracket with the new door.

E. Install Door (Ref. Fig. 401)

NOTE: Torque load bolts (Ref 20-21-11)

Wirelock nuts and bolts (Ref 20-21-13)

Encapsulate nuts and bolts in Viton (Ref 20-22-19).

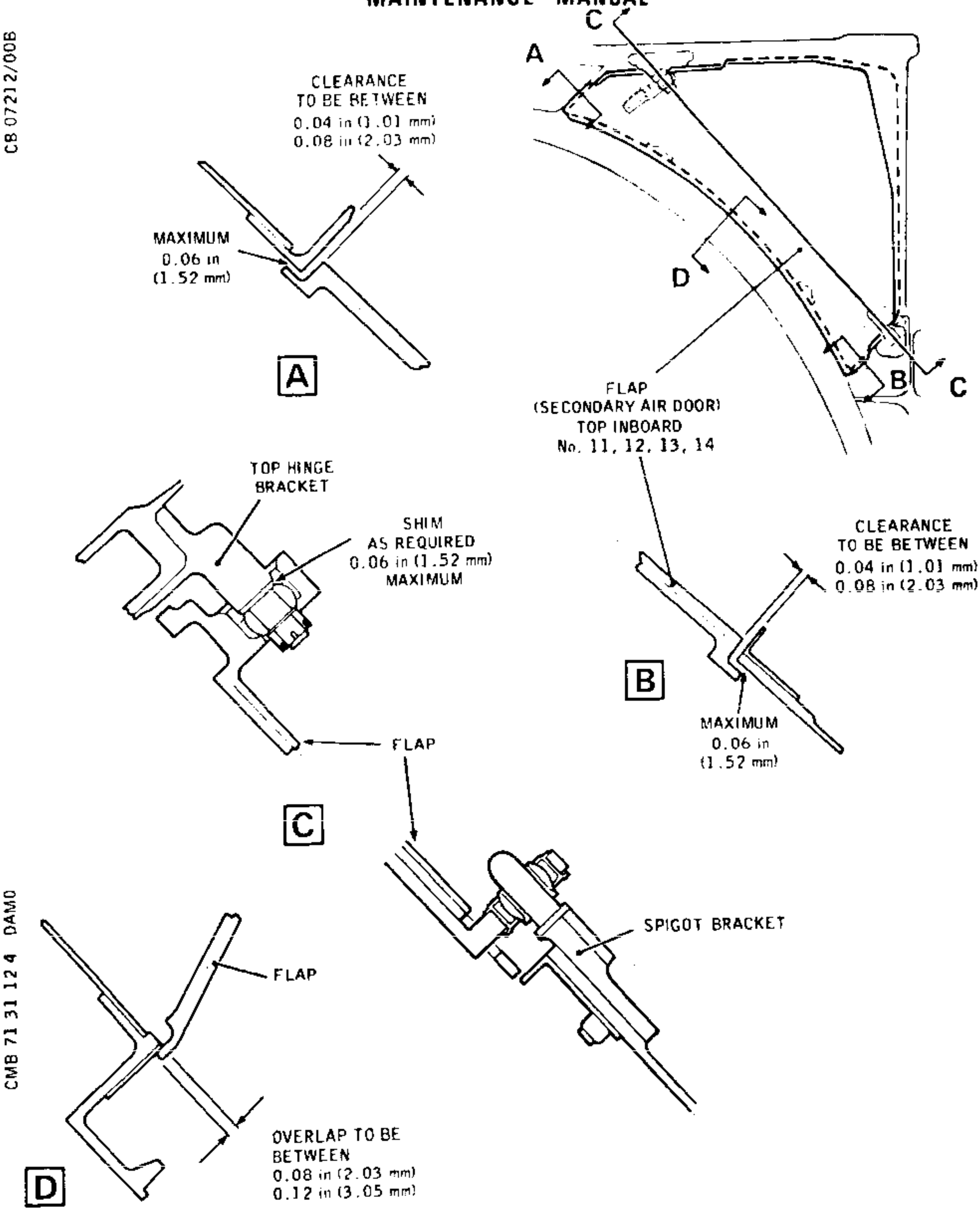
(1) Temporarily install the door:

(a) Place the shims previously retained in the hinge recess on the door.

(b) Engage the door with the top hinge attachment pivot pin.

(c) Temporarily secure the spigot bracket to the bulkhead.

(d) Secure the door on the top hinge pivot with



Door Clearances for a New Installation
Figure 404

a nut and washer. Torque load the nut to between 25 and 30 lbf in (0.29 and 0.34 mdaN).

(e) Check the top and bottom door clearances; these are to be between 0.08 and 0.04 in (2.0 and 1.0 mm).

(f) Check that the door overlap is within the limits defined in Detail C (Ref. Fig. 404).

(2) If the clearances are incorrect, remove the door and adjust the shims to a maximum of 0.60 in (1.52 mm). Re-install the door as in operation (1) above.

(3) If the clearances are satisfactory, complete the installation:

(a) Lock the top hinge pivot nut with a split pin.

(b) Torque load the three bottom spigot bracket bolts to between 40 and 45 lbf in (0.45 and 0.51 mdaN).

(c) Secure the screwjack eye-end to the door with the bolt, washer and nut. Torque load the nut to between 50 and 60 lbf in (0.56 and 0.67mdaN).

F. Conclusion.

(1) Remove the safety clips and set the additional circuit breakers previously tripped.

(2) Adjust and test the doors (Ref. 71-31-00, Adjustment/Test).

(3) Encapsulate each nut and bolt fitted with Viton sealant (Ref. 20-22-19).

(4) Install the intake rings (Ref. 71-21-11, Removal/Installation).

(5) Close the engine bay forward doors (Ref. 71-00-00, Servicing).

4. Doors (Nos 9, 10, 15 and 16) (Ref. Fig. 405)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Torque spanner range: 25-30 lbf in (0.28-0.34 mdaN) 40-45 lbf in (0.45-0.51 mdaN) 50-60 lbf in (0.56-0.67 mdaN) 60-70 lbf in (0.67-0.78 mdaN)	- -
Interphone equipment	-
Viton sealant (Ref. 20-30-00, No 351)	-

B. Prepare to Remove Doors

(1) Open the engine bay forward door (Ref. 71-00-00, Servicing).

(2) Open the secondary air doors (Ref.71-31-00, Servicing).

(3) Trip the following additional circuit breakers and secure them with safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No.1			
SEC. AIR DOOR MTR. SUP	2-213	1K247	C10
SEC. AIR DOOR POSN. IND	1-213	1K238	F 2
Engine No.2			
SEC. AIR DOOR MTR. SUP	2-213	2K247	F10
SEC. AIR DOOR POSN IND	5-213	2K238	C 3
Engine No.3			
SEC. AIR DOOR MTR. SUP	4-213	3K247	A19
SEC. AIR DOOR POSN. IND	5-213	3K238	C 4

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No.4			
SEC. AIR DOOR MTR. SUP	4-213	4K247	F19
SEC. AIR DOOR POSN. IND	1-213	4K238	F 3

(4) Remove, if necessary, the intake rings (Ref. 71-21-11, Removal/Installation).

C. Remove Doors (Ref. Fig. 405)

(1) At the door top attachment, remove the three bolts securing the hinge bracket to the firewall.

NOTE: The Viton covering the nuts and bolts must first be removed.

(2) Manoeuvre the door sufficiently to gain access to the screwjack bolt on the front face of the door.

NOTE: If this is impracticable it may be necessary to remove the screwjack drives from the nearest top and bottom screwjacks and turn the drive shaft manually.

(3) Remove the bolt securing the screwjack to the door; remove the door from the spigot.

D. Prepare to Install (Ref. Fig. 405)

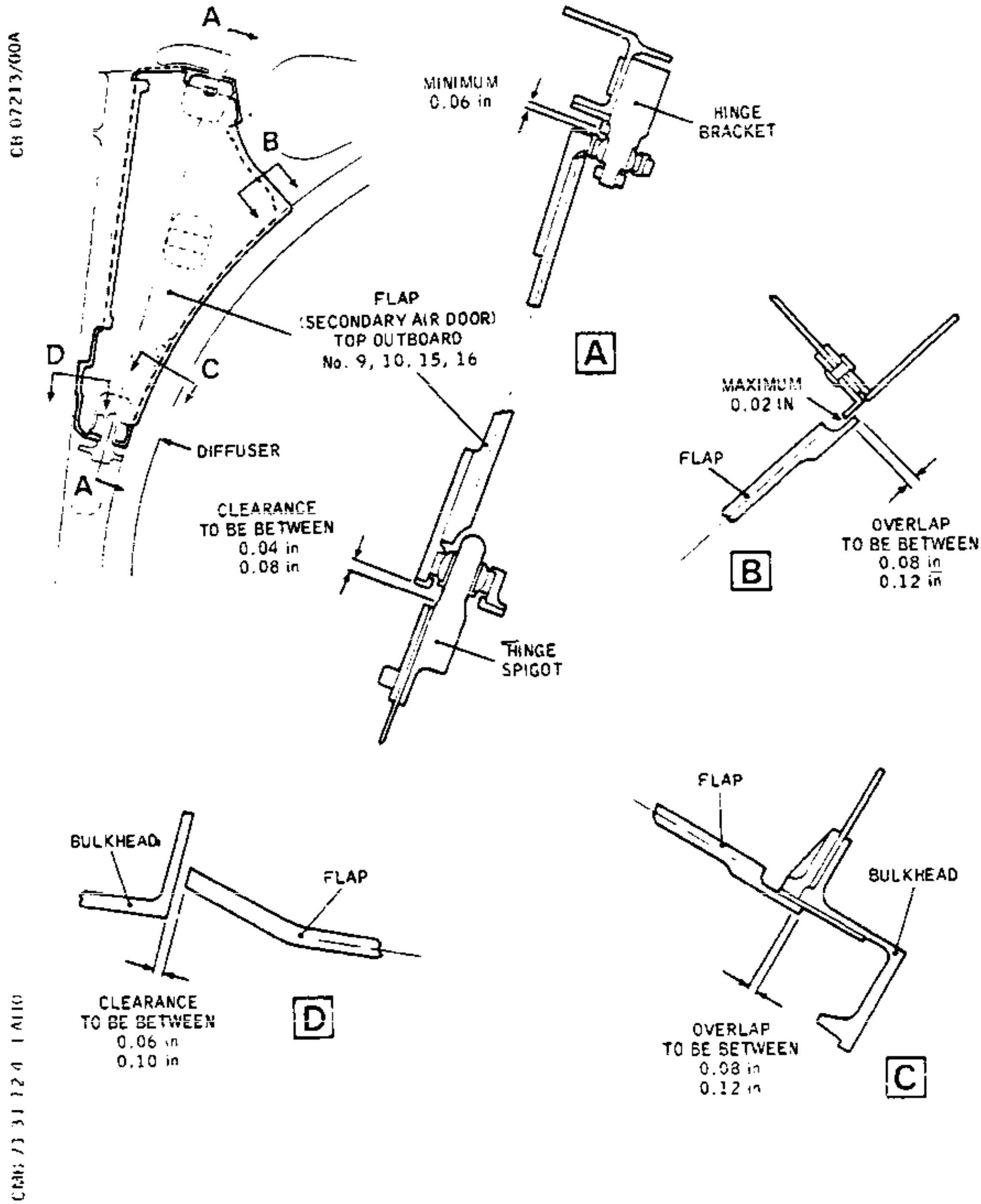
(1) Comply with the electrical safety precautions.

(2) When a new door is to be fitted:

(a) Mark out and drill holes as required in the replacement door.

(b) Apply surface treatment, primer and intumescent paint (Ref.71-31-00, Cleaning/Painting).

(c) Remove the bolt securing the hinge bracket to the existing door; retain the shim set. shim set.



Door clearances for a New Installation
Figure 405

R

(d) Engage the hinge bracket and shims with the new door and secure it with a washer and nut.

(e) Temporarily secure the hinge bracket to the bulkhead and check the top and bottom door clearances, these are to be between 0.080 and 0.040 in (2.0-1.0mm) for the hinge spigot end. Shim if necessary to a maximum of 0.060 in (1.52mm). In addition there is to be a minimum gap of 0.060 in (1.52mm) between the bearing retention sleeve and the adjoining structure.

(f) Torque load the hinge bracket nut to between 25 and 30 lbf in (0.28 and 0.34 mdaN) and lock it with a split pin.

(g) Check that the overlap is within the limits defined on the illustration.

E. Install (Ref. Fig. 401)

NOTE: Torque load bolts (Ref 20-21-11)

Wirelock nut and bolts (Ref 20-21-13)

Encapsulate nuts and bolts in Viton (Ref 20-22-19).

(1) Engage the door with the spigot and align the top hinge bracket with the holes in the firewall. Secure the door with the three bolts.

(2) Torque load the smaller diameter bolts to between 40 and 45 lbf in (0.45 and 0.51 mdaN).

(3) Torque load the larger diameter bolt to between 60 and 70 lbf in (0.67 and 0.78 mdaN).

(4) Secure the screwjack to the door with a bolt nut and washer, torque load the bolt to between 50 and 60 lbf in (0.56 and 0.67 mdaN).

F. Conclusion.

(1) Remove the safety clips and set the additional circuit breakers.

(2) Adjust and test the doors (Ref 71-31-00, Adjustment/Test).

(3) Encapsulate each nut/bolt in Viton (Ref 20-22-19).

NOTE: For this purpose it will be necessary to function the system OPEN, as previously described, to gain access to the forward face of the door.

(4) Install, if necessary, the intake rings (Ref 71-21-11, Removal/Installation).

(5) Close the engine bay forward doors (Ref 71-00-00, Servicing).

R FLEXIBLE DRIVE SHAFTS (SECONDARY AIR DOORS) - SERVICING

WARNING: OBSERVE THE LOCAL REGULATIONS GOVERNING THE USE OF TRICHLOROETHYLENE CLEANING BATHS.

1. General

Lubrication of flexible drive shafts in-situ is not permissible. Therefore, drive shaft assemblies, at all five positions in the engine bay, must be removed from the aircraft and serviced in the workshop.

2. Lubrication

A. Equipment and Materials

DESCRIPTION	PART NO.
Trichloroethylene degreasing bath (Ref. 20-30-00, No.462) or	-
Suitable Ultrasonic degreasing equipment	-
Suitable wire basket	-
Royco 10 (Ref. 20-30-00, No.74)	-
Clean lint free cloth	-

B. Preparation

(1) Remove the drive shafts from engine bay as necessary (Ref. 71-31-13, Removal/Installation).

(2) Remove the flexible drive from its outer casing. Clean all parts of the drive shaft as follows:

NOTE: Ultrasonic degreasing may be used as an alternative.

(a) Place all parts in a wire basket so that degreasing fluid will not be retained in recesses during degreasing.

(b) Immerse all parts in boiling degreasing fluid until all traces of grease and dirt have been removed.

(c) Raise the parts from boiling degreasing fluid and allow them to cool.

(d) Lower the parts into the degreasing fluid vapour until condensation ceases then once again raise the parts clear of the vapour so that any condensation evaporates.

CAUTION: ENSURE THAT ALL PARTS ARE CLEAN, DRY AND FREE FROM ALL TRACES OF CONTAMINATION PARTICULARLY DEGREASING FLUID.

C. Procedure

(1) Fill the outer casing with grease Royco 10.

(2) Insert the drive cable into its outer casing and pull the cable through the casing. Wipe off surplus grease at casing end.

(3) Work the adhering grease, by hand, fully into the drive cable throughout its length then remove excess grease to leave a uniform thin grease film. Take care not to contaminate the greased drive cable with foreign particles.

(4) Refit the drive cable to its outer casing (Ref. Table 1).

(5) Turn the drive cable within the outer casing several times to ensure satisfactory distribution of the grease in the flexible drive.

FLEXIBLE DRIVES PART NO.	CABLE DRIVE LENGTH IN	(MM)
6355209/1 6355211/1	37.24 to 37.27	(945.9 to 946.7)
6355209/2 6355211/2	35.29 to 35.32	(896.3 to 897.1)
6355209/3 6355211/3	53.56 to 53.62	(1360.4 to 1361.9)
6355209/4 6355211/4	43.91 to 43.97	(1115.3 to 1116.8)
6355209/5 6355211/5	42.61 to 42.67	(1082.3 to 1083.8)

FLEXIBLE DRIVES PART NO.	CABLE DRIVE LENGTH IN	(MM)
6355209/6 6355211/6	52.66 to 52.72	(1337.6 to 1339.1)
6355210/1	18.32	(465.3)
6355210/2	14.32	(363.7)

Flexible Drive Cable Lengths
Table 1

D. Install

(1) Install drive shaft assemblies (Ref. 71-31-13, Removal/Installation).

DISCONNECTED OR BEING RE-ENGAGED.

WHEN DISCONNECTING OR CONNECTING FLEXIBLE DRIVES DO NOT STRETCH THE OUTER CASING.

NOTE: Torque load nuts (Ref.20-21-11).
Wire-lock nuts (Ref.20-21-13).

(1) At the motor access panel, disconnect the drive-shaft from the motor and remove the centre core of the drive-shaft.

(2) Wipe the surface of the drive-shaft centre core with a clean lint-free cloth.

(3) Apply the approved grease to the drive-shaft centre core by hand.

(4) Install the centre core of the drive, ensure that the core is engaged with the screwjack at one end and the motor at the other. Secure the drive with the union nut, tighten to a nominal torque.

CAUTION: DO NOT DISTURB THE EQUIPMENT SETTINGS.

(5) Torque-tighten the drive-shaft nut to between 40 and 65 lbf in (0.45 and 0.73 mdaN). Wire-lock the drive union nut to the motor.

(6) At the motor access panel, disconnect the drive-shaft from the indication switch unit and remove the centre core of the drive-shaft; lubricate and install the drive-shaft (Ref. operations (2), (3), (4) and (5)). Wire-lock the union nut to the indication switch unit.

(7) At the lower inboard secondary air door, disconnect the drive-shaft from the top side of the screwjack (the side remote from the motor) and remove the centre core of the drive-shaft; lubricate and install the drive-shaft (Ref. operations (2), (3), (4) and (5)). Wire-lock the union nut to the screw-jack.

(8) At the top outboard secondary air door, disconnect the drive shaft from the top side of the screwjack (the side remote from the motor) and remove the centre core of the drive-shaft; lubricate and install the drive-shaft (Ref. operations (2), (3), (4) and (5)). Wire-lock the union nut to the screw-jack.

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(9) At the lower outboard secondary air door, disconnect the drive-shaft from the top side of the screwjack (the side remote from the indication switch unit) and remove the centre core of the drive-shaft; lubricate and install the drive-shaft (Ref. operations (2), (3), (4) and (5)). Wire-lock the union nut to the screwjack.

D. Conclusion

(1) Remove the safety clips and reset the circuit breakers previously tripped.

(2) Check that the area is clean and carry out a functional test of the secondary air doors (Ref. 71-31-00, Adjustment/Test).

(3) Close the engine bay doors (Ref. 71-00-00, Servicing).

(4) Check that the area is clean and close the motor access panel, torque-tighten the fasteners to 30 lbf in (0.34 mdaN).

(5) Remove the warning placard from panel 1-214.

E. To determine which lubricant has been used on the secondary airdoor flexible drives, note the following:-

(1) All the flexible drives lubricated with Royco 10 have a heat shrink sleeve (approx 2" long or more) over the outer wrap of the drive at each end adjacent to the drive shaft nut.

A drive lubricated with Aeroshell 7 has no heat shrink sleeve fitted.

(2) A drive lubricated with Royco 10 should not be lubricated with Aeroshell 7 and vice versa without first ultrasonically cleaning the drive.

(3) The part numbers of the drives are given for information (Ref. Fig. 302).

Bay	No	Item	Aeroshell 7 P/No. Pre SB71-40 Std.	Royco 10 P/No. SB71-40 Standard
	1	Flexible Drive	AEC6355012-2	AEC6355210-2
	2	" "	AEC6355011-3	AEC6355211-3
	3	" "	AEC6355011-2	AEC6355211-2
Bay	4	" "	AEC6355011-4	AEC6355211-4

	Bay	No	Item	Aeroshell 7 P/No. Pre SB71-40 Std.	Royco 10 P/No. SB71-40 Standard
B	1	5	" "	AEC6355012-1	AEC6355210-1
B		6	Screwjack RH	AE 4125-002	AE 4125-002
B		7	" LH	AE 4124-002	AE 4124-002
B	All	(8	Motor	AE 4729-102	AE 4729-102
	Bays	(9	Indicator S/W	AE 4730-102	AE 4730-102
B					
B		1	Flexible Drive	AEC6355012-2	AEC6355210-2
B		2	" "	AEC6355011-5	AEC6355211-5
B		3	" "	AEC6355011-1	AEC6355211-1
B	Bay	4	" "	AEC6355011-6	AEC6355211-6
	2	5	" "	AEC6355012-1	AEC6355210-1
B		6	Screwjack RH	AE 4125-002	AE 4125-002
B		7	" LH	AE 4124-002	AE 4124-002
B					
B		1	Flexible Drive	AEC6355012-2	AEC6355210-2
B		2	" "	AEC6355011-6	AEC6355211-6
B		3	" "	AEC6355011-1	AEC6355211-1
B	Bay	4	" "	AEC6355011-5	AEC6355211-5
	3	5	" "	AEC6355012-1	AEC6355210-1
B		6	Screwjack RH	AE 4125-002	AE 4125-002
B		7	" LH	AE 4124-002	AE 4124-002
B					
B		1	Flexible Drive	AEC6355012-2	AEC6355210-2
B		2	" "	AEC6355011-4	AEC6355211-4
B		3	" "	AEC6355011-2	AEC6355211-2
B	Bay	4	" "	AEC6355011-3	AEC6355211-3
B	4	5	" "	AEC6355012-1	AEC6355210-1
B		6	Screwjack RH	AE 4125-002	AE 4125-002
B		7	" LH	AE 4124-002	AE 4124-002
B					

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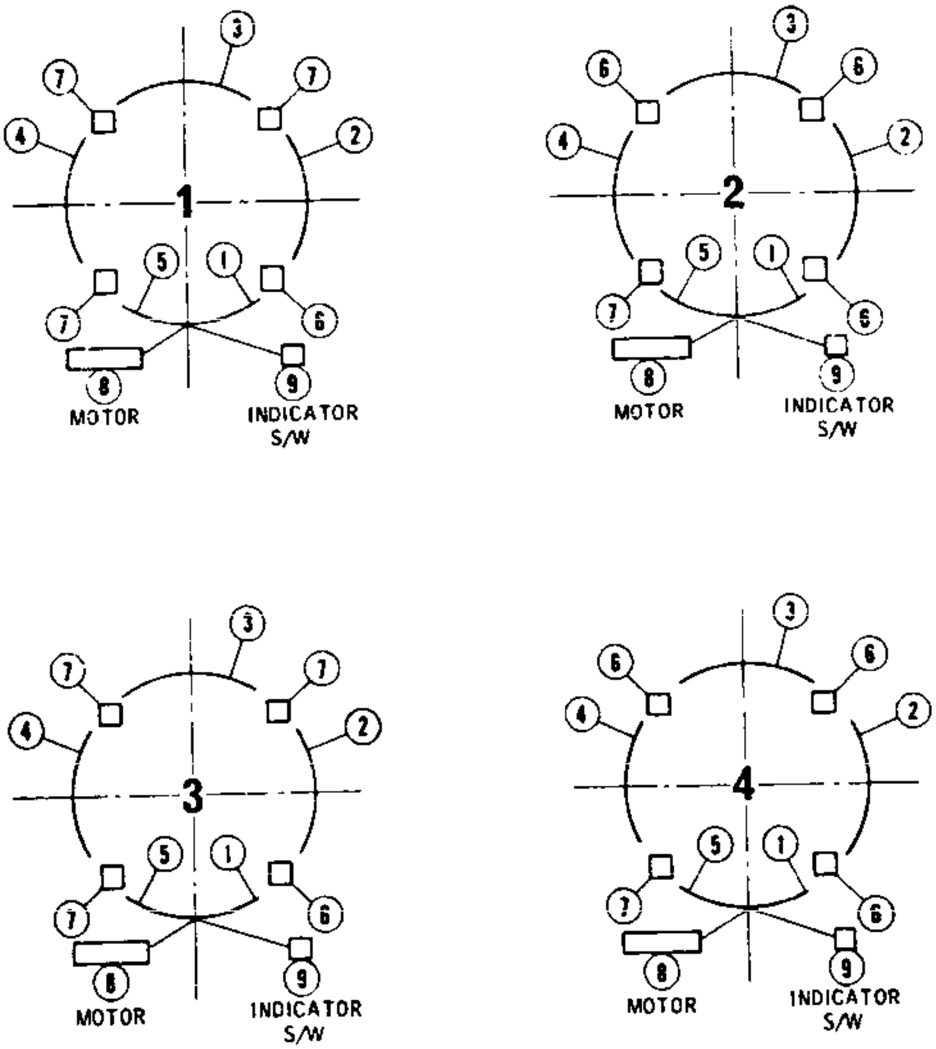

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Flex drives - View Looking Forward
Figure 302

B

R

FLEXIBLE DRIVE SHAFTS (SECONDARY AIR DOORS) - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Five flexible drive shafts are fitted within the rear structure of each engine air intake on the forward face of the fireproof bulkhead, around the intake diffuser. The shafts, together with four screwjacks, form a continuous drive for the four secondary air doors between the motor and indication switch unit. To gain access, open the forward engine bay door, open the secondary air doors and the motor access panel.
This topic describes the removal and installation of a typical shaft.

2. Flexible Drive Shaft

A. Equipment and Materials

DESCRIPTION	PART NO
Circuit breaker safety clips	-
Torque spanner range: 40-45 lbf in (0.45-0.51 mdaN) R 40-65 lbf in (0.45-0.73 mdaN) 30-40 lbf in (0.34-0.45 mdaN)	 - -
Torque-set screwdriver R 20-30 lbf in (0.23-0.34 mdaN)	
Interphone equipment	-
Corrosion resistant steel wire R 0.031 in (0.8 mm) dia	- -
Viton sealant (20-30-00 No. 351)	-
Ground electrical power source of 200V,3 phase,400 Hz with a fourth neutral wire	-
Test Set	TE5101

R

B. Prepare to Remove Drive Shaft (Ref. Fig. 402)

(1) Open the engine bay forward door (Ref.71-00-00, Servicing).

(2) Trip the circuit breakers for the appropriate engine and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine No.1			
ENG l SEC AIR DOOR MTR SUP.	2-213	1K247	C10
ENG l SEC AIR DOOR POSN IND.	1-213	1K238	F2
Engine No.2			
ENG 2 SEC AIR DOOR MTR SUP	2-213	2K247	F10
ENG 2 SEC AIR DOOR POSN IND.	5-213	2K238	C3
Engine No.3			
ENG 3 SEC AIR DOOR MTR SUP.	4-213	3K247	A19
ENG 3 SEC AIR DOOR POSN IND.	5-213	3K238	C4
Engine No.4			
ENG 4 SEC AIR DOOR MTR SUP	4-213	4K247	F19
ENG 4 SEC AIR DOOR POSN IND	1-213	4K238	F3

(3) Remove transition rings (Ref. 71-21-11, Removal/ Installation) if access is required to the top secondary air door nearest the engine bay centre wall.

(4) Connect the test set and open the secondary air doors:

NOTE: If this is impracticable then access to the drive may be obtained by removing the secondary air door(s) (Ref. 71-31-12, Removal/Installation).

(a) Open the motor access panel (411NB).

R (b) Disconnect the aircraft electrical
R connectors from the motor and indication switch.

R (c) Connect the test set connectors to the
R receptacle on the motor and indication switch.

(d) Connect the test set SUPPLY receptacle to a 3 phase, 200V, 400Hz power source with a fourth neutral wire.

(e) Check that the GO light is illuminated.

CAUTION: DO NOT OPERATE THE DOORS MORE THAN ONE CYCLE OF OPERATION IN TWO MINUTES.

(f) Select OPEN on the FIRE FLAP CONTROL MOTOR switch and press the INCHING CONTROL button until the doors are fully open.

C. Remove Shaft (Ref. Fig. 401)

NOTE: A drive shaft may be removed and replaced without adjustment if the equipment settings are not disturbed.

(1) Disconnect the nuts securing the shaft at each end to the screwjacks; or, in the case of a
R lower drive, to the motor or indication switch.

(2) When removing a side drive remove the C-clips:

(a) Remove the Viton sealant encasing the bolt and nut.

(b) Remove the bolt securing the C-clip; retain the parts.

CAUTION: DO NOT TURN THE SHAFT, SCREWJACK, MOTOR OR INDICATION SWITCH.

(3) Withdraw the shaft from the conduit and through the secondary air door aperture, or where a lower shaft is being removed, through the access panel aperture.

(4) Fit approved blanks to the screwjacks or other components as necessary.

D. Prepare to Install Drive Shaft (Ref. Fig. 401)

(1) Comply with the electrical safety precautions.

(2) Ensure that the conduit is clean and unobstructed.

(3) Check that the protrusion of the inner core at each end of the shaft (Detail E) is between 0.53 and 0.56 in (13.462 and 14.224 mm).

(4) Remove the blanks from the screwjacks, motor and indication switch as necessary for the location and number of shafts being fitted.

E. Install Shaft

NOTE: 1. Torque-tighten bolts (Ref. 20-21-11).

2. Wire-lock nuts and bolts (Ref. 20-21-13).

3. Encapsulate nuts and bolts with Viton (Ref. 20-22-19).

(1) Pass the shaft into and through the conduit.

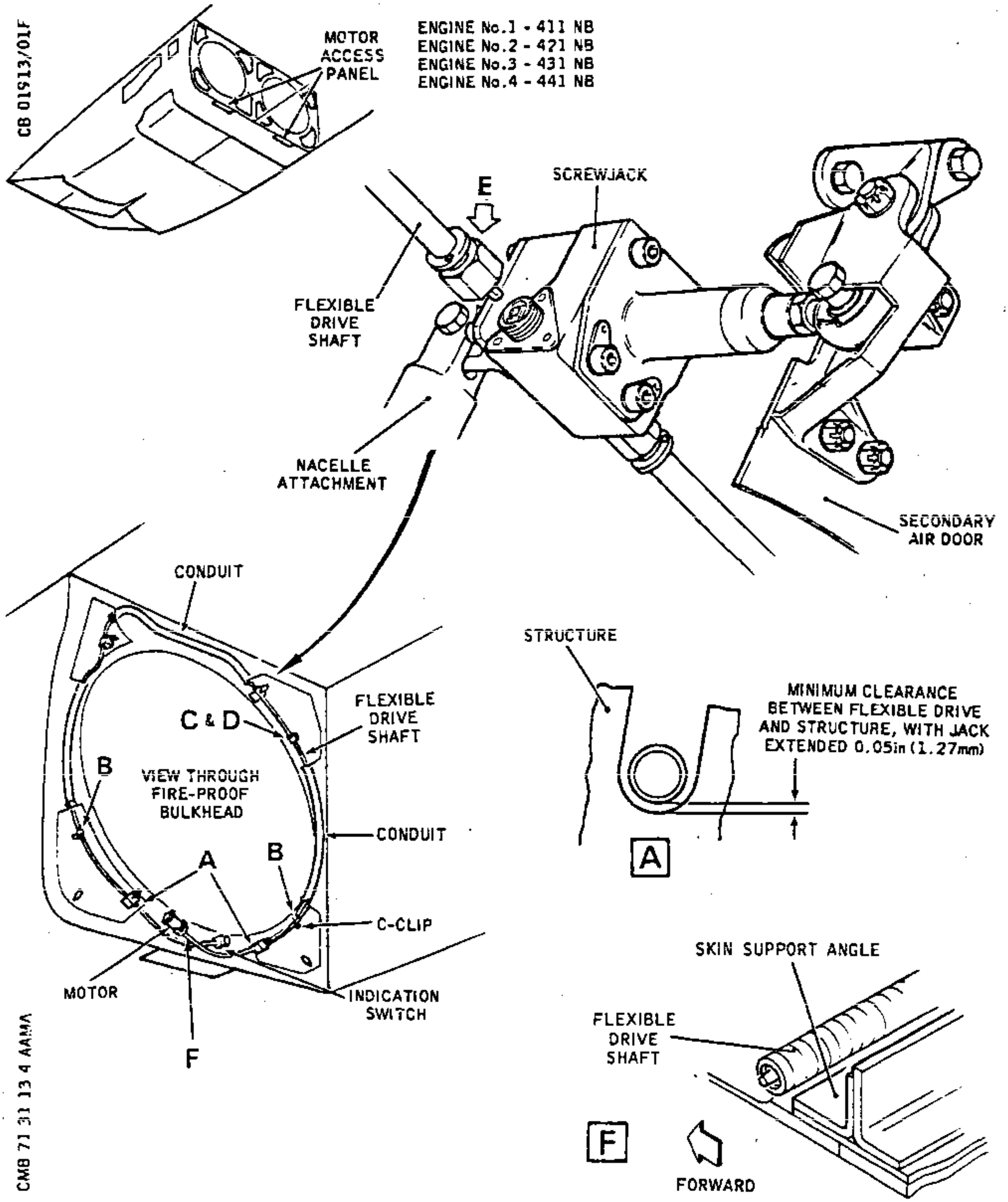
(2) Engage the squared ends of the shaft with each screwjack and secure the ends to the screwjacks with the shaft nuts.

CAUTION: ENSURE THAT THE CENTRE CORE OF THE FLEXIBLE DRIVE REMAINS ENGAGED WITH THE EQUIPMENT DURING INSTALLATION. DO NOT ROTATE THE SCREWJACK, MOTOR OR INDICATION SWITCH UNIT DRIVES WHILE THE SHAFTS ARE DISCONNECTED OR BEING RE-ENGAGED.

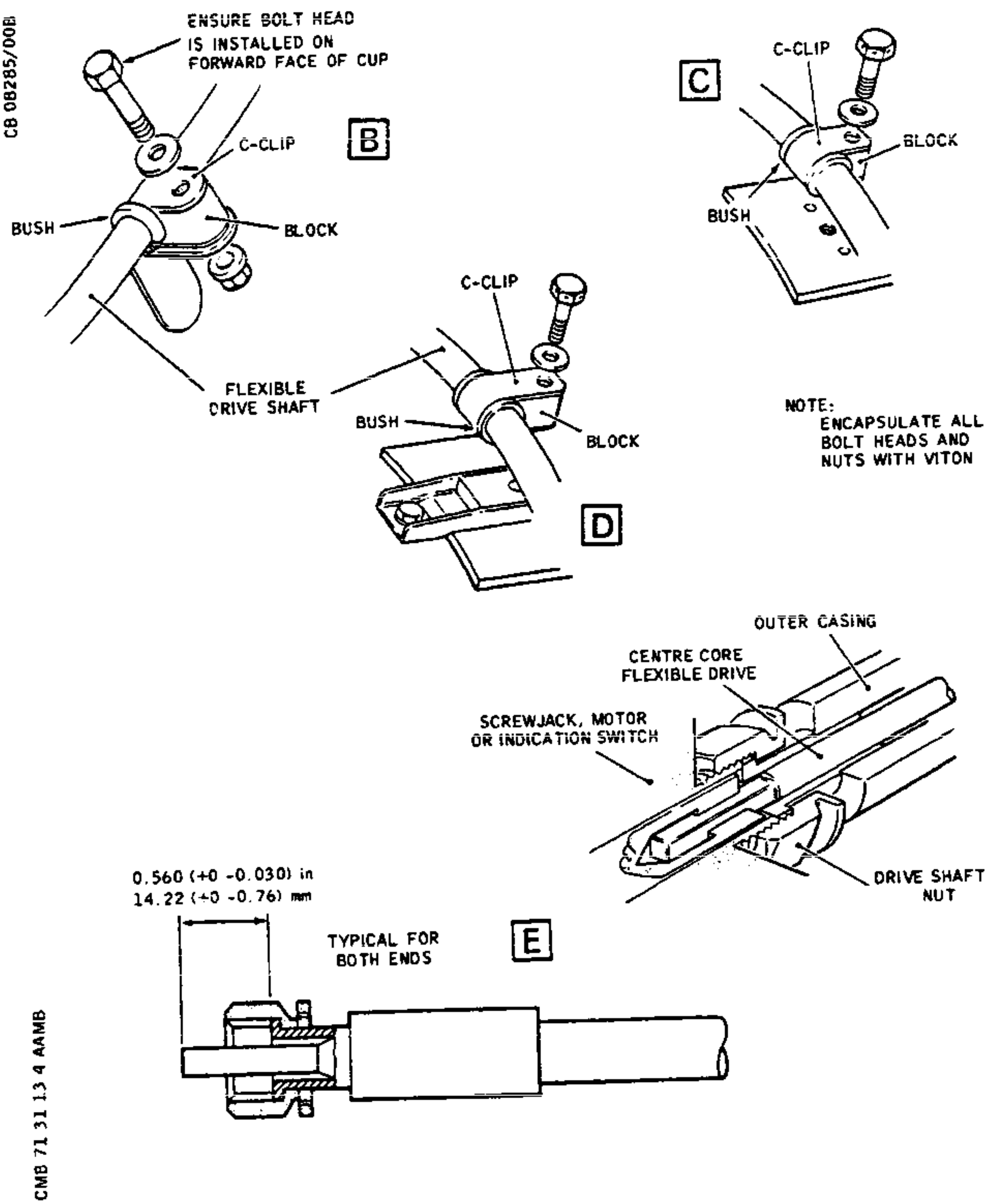
(3) When fitting a lower drive, engage the squared ends of the shaft with a screwjack and the motor, or with a screwjack and the indication switch as appropriate, to the shaft being fitted.

(4) On the lower drives, check that there is a minimum gap of 0.05 in (1.27 mm) between the flexible drive and the structure (Ref.Detail A) with the screwjacks
R extended. Ensure that the flexible drive shaft
R assembly to the indicator switch is routed in front
R of the skin support angle and lies naturally in
R position (Ref.Detail F).

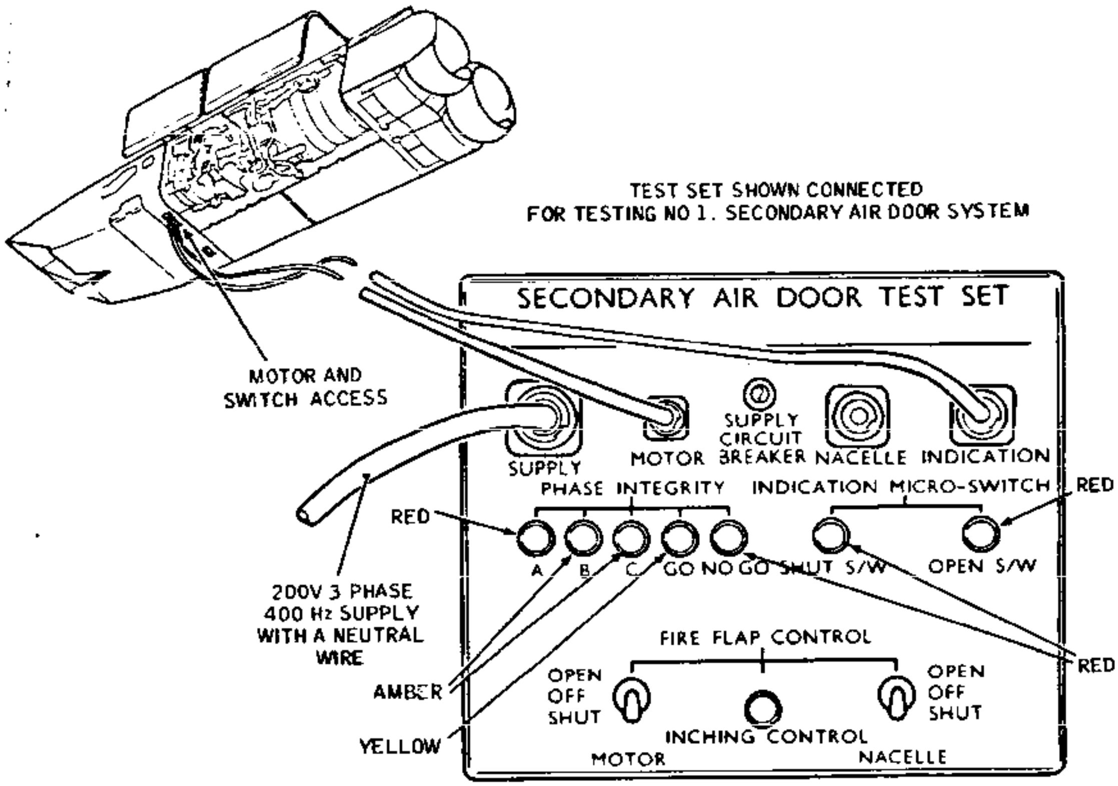
(5) Torque-tighten each end of the shaft to between



R Flexible Drive Shafts - Installation
R (Sheet 1 of 2)
R Figure 401



Flexible Drive Shafts - Installation
(Sheet 2 of 2)
Figure 401



TEST SET CONNECTIONS

	MOTOR	INDICATION
ENGINE 1	CONNECT TO SEC. AIR DOOR MOTOR RECEPTACLE 1K250	CONNECT TO INDICATING SWITCH UNIT RECEPTACLE 1K257
ENGINE 2	CONNECT TO SEC. AIR DOOR MOTOR RECEPTACLE 2K250	CONNECT TO INDICATING SWITCH UNIT RECEPTACLE 2K257
ENGINE 3	CONNECT TO SEC. AIR DOOR MOTOR RECEPTACLE 3K250	CONNECT TO INDICATING SWITCH UNIT RECEPTACLE 3K257
ENGINE 4	CONNECT TO SEC. AIR DOOR MOTOR RECEPTACLE 4K250	CONNECT TO INDICATING SWITCH UNIT RECEPTACLE 4K257

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Secondary Air Door - Test Set
Figure 402

40 and 65 lbf in (0.45 and 0.73 mdaN), and wire-lock.

(6) When fitting a side shaft, secure the C-clips in the lower secondary air door aperture, using a bolt, block, bush, clip, washer and a nut (Detail B). Torque-tighten the bolt to between 30 and 40 lbf in (0.34 and 0.45 mdaN). Encapsulate the bolt head and nut using Viton sealant (Ref. 20-22-19).

(7) The top outboard secondary air door drive clip is secured by a block, bush, bolt and washer and, on some aircraft, a distance piece. (Detail D). Torque-tighten the bolt to between 40 and 45 lbf in (0.45 and 0.51 mdaN) and lock the head with locking wire to the nearby lug. Encapsulate the bolt head using Viton sealant in accordance with the instructions given in 20-22-19.

F. Conclusion

(1) Ensure that the area surrounding the secondary air doors is clean.

(2) Using the test set, carry out a functional test, close the doors and check the door clearances (Ref. 71-31-00, Adjustment/Test).

(3) Disconnect and remove the test set from the motor and the indication switch.

(4) Reconnect the aircraft electrical connectors at the motor and indication switch ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(5) Check that the area is clean; close and lock the motor access panel (411NB). Torque-tighten the fasteners to 30 lbf in (0.34 mdaN).

(6) Check that the area is clean; fit the intake rings (Ref. 71-21-11, Removal/Installation).

(7) Remove the circuit breaker safety clips and reset the additional circuit breakers previously tripped.

(8) Carry out the operational test of the secondary air doors (Ref. 71-31-00. Adjustment/Test).

(9) Check that the area is clean; close and lock the forward engine bay door (Ref. 71-00-00, Servicing).

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SECONDARY AIR DOOR MOTOR - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

An electrically operated motor is located in the floor structure at the rear of each engine intake. The motor, which engages with the flexible drive of the secondary air door operating mechanism, is controlled by a switch at the 3CM station and by operation of the relevant engine shut-down handle. Access to the motor is from a panel on the underside of the intake.

2. Remove Motor - Secondary Air Doors Closed

A. Equipment and Materials

	DESCRIPTION	PART NO.
R	Torque spanner range:	
R	40-65 lbf in (0.45 - 0.73 mdaN)	-
R	60-70 lbf in (0.67 - 0.78 mdaN)	-
R	Corrosion resistant steel wire	-
R	0.028 in (0.71 mm) dia	-
R	Viton sealant (Ref. 20-30-00,No.351)	-
R	Torque limiting screwdriver	
R	range:	
R	25-30 lbf in (0.29 - 0.34 mdaN)	-
R	Test set	TE 5101
R		
R	Ground power source to supply	
R	200V 3 phase 400 Hz with a	
R	fourth neutral wire.	-
R		

B. Prepare

(1) Physically check that the secondary air doors are closed:

(a) Open the engine bay forward doors (Ref. 71-00-00 Servicing)

(b) Trip the additional circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No. 1			
SEC.AIR DOOR MTR.SUP	2-213	1K247	C10
SEC.AIR DOOR POSN.IND	1-213	1K238	F 2
Engine No.2			
SEC.AIR DOOR MTR.SUP	1-213	2K247	F10
SEC.AIR DOOR POSN.IND	5-213	2K238	C 3
Engine No.3			
SEC.AIR DOOR MTR.SUP	4-213	3K247	A19
SEC.AIR DOOR POSN.IND	5-213	3K238	C 4
Engine No.4			
SEC.AIR DOOR MTR.SUP	4-213	4K247	F19
SEC.AIR DOOR POSN.IND	1-213	4K238	F 3

(2) Open the motor access panel.

C. Remove (Ref. Fig. 401)

(1) Loosen the nut retaining the flexible drive shaft to the motor; disconnect the drive from the motor.

<u>CAUTION</u>: ENSURE THAT THE CENTRE CORE OF THE DRIVE REMAINS ENGAGED WITH THE SCREWJACK. DO NOT ROTATE THE SCREWJACK, MOTOR OR INDICATION

R SWITCH UNIT DRIVES WHILE THE SHAFTS ARE
R DISCONNECTED OR BEING RE-ENGAGED.

(2) Disconnect the electrical plug from the receptacle on the motor.

(3) Remove the Viton sealant from the bolt heads securing the motor.

(4) Support the motor and remove the four bolts securing the motor to the brackets in the intake structure. Lower the motor through its aperture.

(5) Fit blank covers to the motor.

D. Prepare to Install

(1) Comply with the electrical safety precautions.

(2) Check that the motor is set to the shut datum position (Ref. 71-31-14 Adjustment/Test).

NOTE: A new motor will be received from stores set in the SHUT datum position.

(3) Remove the blank covers from the motor, screwjack and driveshaft.

CAUTION: DO NOT TURN THE MOTOR OUTPUT SHAFT.

R (4) Ensure that the system in the shut datum position
R (Ref. 71-31-00, Adjustment/Test).

E. Install Motor (Ref. Fig.401 and 402)

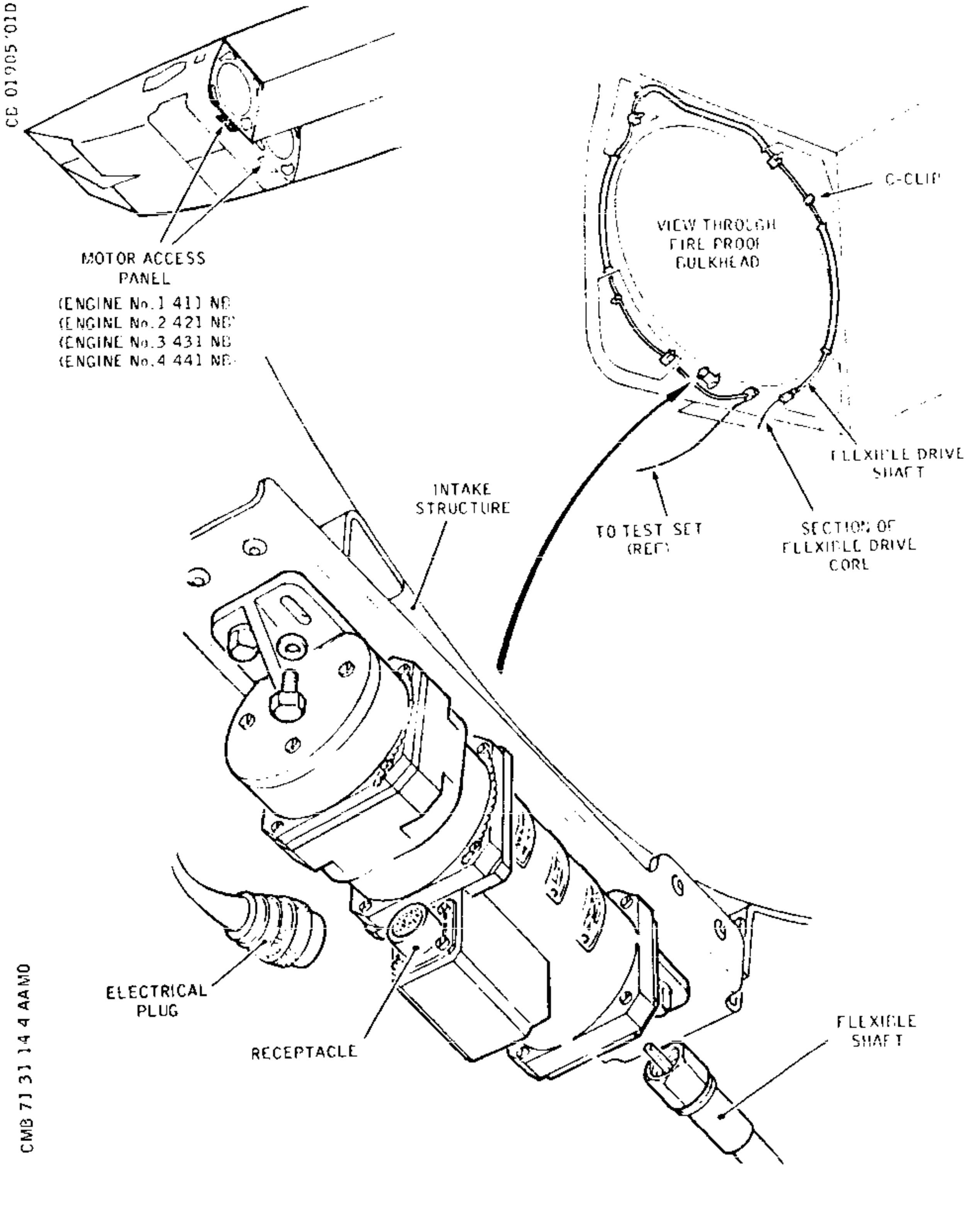
NOTE: Torque tighten bolts (Ref. 20-21-11).

Wirelock nuts and bolts (Ref. 20-21-13).

Encapsulate nuts and bolts with Viton (Ref. 20-22-19).

(1) Position the motor on its mounting in the intake and secure the motor to the intake bracket with washers and bolts. Torque load each bolt to between 70 and 80 lbf in (0.78 and 0.89 mdaN) and lock adjacent bolt heads together with wire.

(2) Engage the flexible drive shaft with the motor. Ensure that the centre core of the flexible drive remains engaged with the equipment during install-



R Secondary Air Door Motor = Installation
Figure 401

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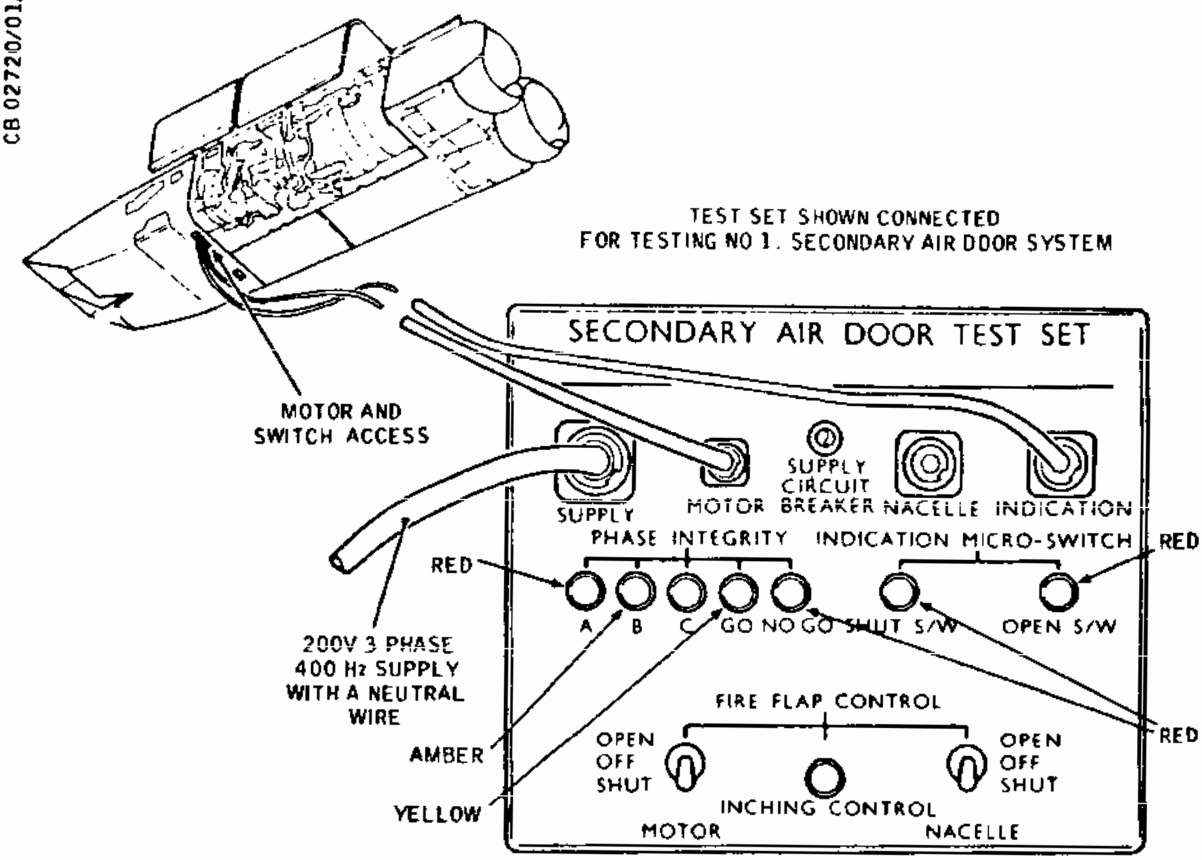

TEST SET CONNECTIONS

	MOTOR	INDICATION
ENGINE 1	CONNECT TO SEC. AIR DOOR MOTOR RECEPTACLE 1K250	CONNECT TO INDICATING SWITCH UNIT RECEPTACLE 1K257
ENGINE 2	CONNECT TO SEC. AIR DOOR MOTOR RECEPTACLE 2K250	CONNECT TO INDICATING SWITCH UNIT RECEPTACLE 2K257
ENGINE 3	CONNECT TO SEC. AIR DOOR MOTOR RECEPTACLE 3K250	CONNECT TO INDICATING SWITCH UNIT RECEPTACLE 3K257
ENGINE 4	CONNECT TO SEC. AIR DOOR MOTOR RECEPTACLE 4K250	CONNECT TO INDICATING SWITCH UNIT RECEPTACLE 4K257

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R

Secondary Air Doors - Test Set
Figure 402

ation, then tighten the shaft nut to between 40 and 65 lbf in (0.45 and 0.73 mdaN). Do not lock the drive shaft.

R R (3) Connect the test set and carry out a secondary air door functional test (Ref.71-31-00, Adjustment/Test).

R (4) When satisfactory check the torque loading of the of the drive shaft nut and lock it with wire to a securing bolt.

NOTE: If the result is still unsatisfactory check the braking run of the motor (Ref. 71-31-14, Adjustment/Test).

R (5) Encapsulate the bolts in Viton sealant to 20-22-19.

F. Conclusion

(1) Ensure that the area is clean, and lock the motor access panel. Torque load the fasteners to 30 lbf in (0.34 mdaN).

(2) Remove the safety clips and set the circuit breakers previously tripped.

(3) Carry out an operational test of the
R secondary air doors (Ref. 71-31-00, Adjustment/ Test).

(4) Check that the area is clean, and close and lock the engine bay forward door (Ref. 71-00-00, Servicing).

3. Remove Motor - Secondary Air Doors Not Closed

A. Equipment and Materials

DESCRIPTION	PART NO.
Test set	TE5101
Circuit breaker safety clips	-
Torque spanners range:	
40-65 lbf in (0.45 and 0.73 mdaN)	-
60-70 lbf in (0.67 and 0.78 mdaN)	-

DESCRIPTION	PART NO.
Torque limiting screwdriver range: 25-30 lbf in (0.29 - 0.34 mdaN)	-
Viton sealant (Ref. 20-30-00 No. 351)	-
Corrosion resistant steel wire 0.028 in (0.71 mm) dia	-
Ground power source to supply 200V 3 phase 400 Hz with a fourth neutral wire.	-

B. Prepare

(1) Place a warning placard at the 3CM station to indicate that work is being carried out on the secondary air doors.

(2) Trip the additional circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine No. 1			
SEC.AIR DOOR MTR SUP	2-213	1K247	C10
SEC.AIR DOOR POSN.IND	1-213	1K238	F2
Engine No. 2			
SEC.AIR DOOR MTR.SUP	2-213	2K247	F10
SEC.AIR DOOR POSN.IND	5-213	2K238	C3
Engine No. 3			
SEC.AIR DOOR MTR.SUP	4-213	3K247	A19

SEC.AIR DOOR POSN. IND	5-213	3K238	C4
Engine No. 4			
SEC.AIR DOOR MTR.SUP.	4-213	4K247	F19
SEC.AIR DOOR POSN.IND	1-213	4K238	F3

(3) Remove the motor access panel.

(4) Open the engine bay doors (Ref. 71-00-00, Servicing).

C. Remove Motor (Ref. Fig. 401)

(1) Set the secondary air door drive to the SHUT datum position:

NOTE: 1. The datum SHUT position may also be established using the aircraft indication system. The required 55 revolutions of the flexible drive are counted from the point at which the magnetic indicator cross hatch changes to SHUT when turning in the shut direction, providing the indication switch unit has not been disturbed.

(a) Loosen the nut securing the flexible drive shaft to the motor, disconnect the drive end.

(b) Disconnect the electrical plugs from the receptacles on the motor and indication switch unit.

(c) Connect the INDICATION receptacle on the test set with the receptacle on the indication switch using the cable provided.

(d) Connect the test set SUPPLY receptacle to a 3 phase, 200V,400 Hz power source with a fourth neutral wire.

(e) Using a handbrace and a flexible drive shaft inner inserted in the first screwjack, turn the complete drive in a clockwise direction, viewed from the motor driven side of the screw-jack, until the SHUT S/W indicator light illuminates. Continue to turn a further 55 revolutions in the same direction then stop.

R R NOTE: The system is now in the SHUT datum position and should not be disturbed.

(2) Remove the Viton sealant from the motor bolts.

(3) Support the motor and remove the four bolts securing the motor to the brackets in the intake structure; remove the motor.

(4) Fit blank covers to the the motor receptacles.

D. Prepare to Install

(1) Comply with the electrical safety precautions.

(2) Check that the area is clean.

(3) Check that the motor is set to the SHUT datum (Ref. 71-31-14, Adjustment/Test), and remove the blanks.

NOTE: New motors will be received from stores set to the SHUT datum and labelled accordingly.

E. Install

NOTE: Torque tighten bolts to 20-21-11.

Wirelock nut and bolts to 20-21-13.

Encapsulate nuts and bolts with Viton to 20-22-19.

(1) Position and support the motor on its mounting in the nacelle and secure it with washers and bolts. Torque load each bolt to between 70 and 80 lbf in (0.78 and 0.89 mdaN) and lock adjacent bolt heads together with wire.

(2) Engage the flexible drive shaft with the motor and tighten the nut at the motor end.

CAUTION: ENSURE THAT THE CENTRE CORE OF THE FLEXIBLE DRIVE REMAINS ENGAGED WITH THE EQUIPMENT DURING INSTALLATION.

R R R (3) Torque tighten the nut at the motor end of the drive shaft to between 40 and 65 lbf in (0.45 and 0.73 mdaN). Do not lock the ends of the drive shaft.

R (4) Functionally test the secondary air doors (Ref. 71-31-00, Adjustment/Test).

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R (5) Re-check the torque loading of the drive shaft nut
R and lock it with wire to a securing bolt.

(6) Encapsulate the motor bolts in Viton sealant to 20-22-19.

F. Conclusion

R (1) Disconnect the test set and re-connect the aircraft
R electrical supply to the motor and indication switch
R unit.

R (2) Ensure that the area is clean; close and lock the motor access panel. Torque load the fasteners to 30 lbf in (0.34 mdaN).

R (3) Remove the safety clips and set the circuit breakers previously tripped.

R (4) Remove the warning placard from the 3CM station.

R (5) Carry out an operational test of the secondary
R air doors (Ref. 71-31-00, Adjustment/Test).

R (6) Check that the area is clean; close and lock the engine bay doors (Ref. 71-00-00, Servicing).

SECONDARY AIR DOOR MOTOR - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECUATIONS DETAILED IN 24-00-00.

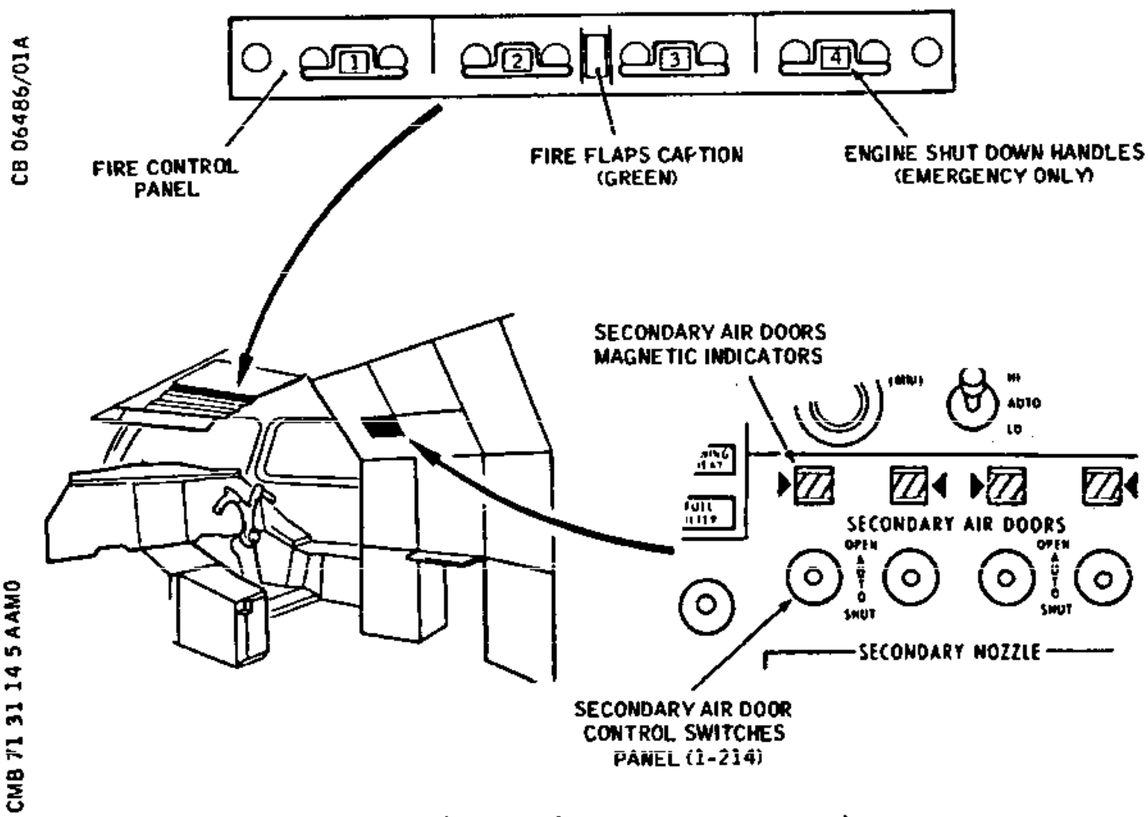
1. General

R This topic describes the datum shut position, and two
R secondary air door motor tests. The tests are given for
R the motor in No. 1 intake; the tests for other motors are
R similar.

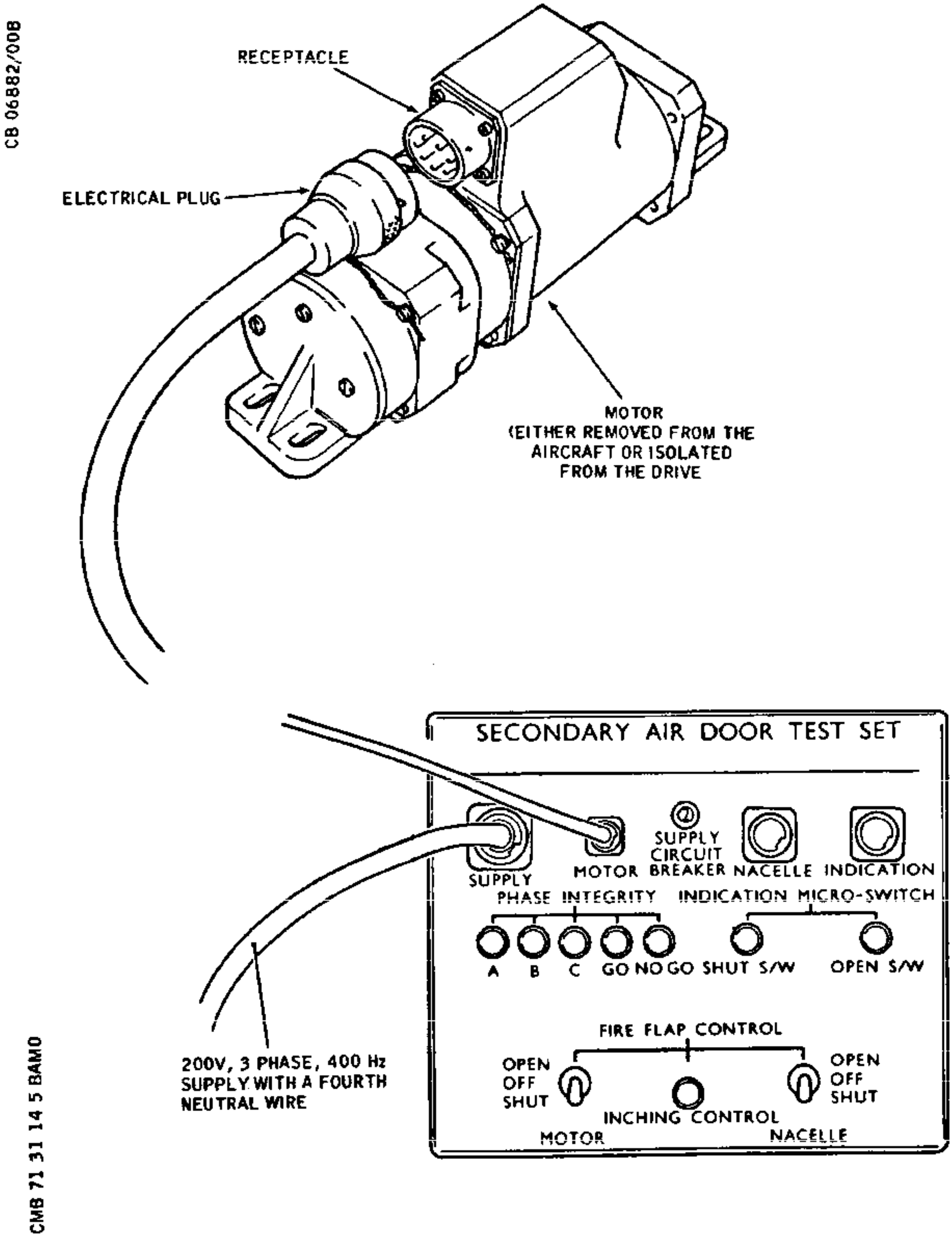
R In service brake wear causes variations in the 'run-down'
R revolutions of a motor. These variations will conform
R roughly to the following pattern; for a bench-run motor:
R New motor - 13 braking revolutions
R Motor with bedded in brakes - 10 braking revolutions
R Motor after extensive use - 20 braking revolutions

2. Adjustment - To set the Motor Shut Datum

(Ref. Fig.501 and 502)



Secondary Air Doors - Testing
Figure 501



R Motor - Setting the Shut Datum
Figure 502

A. Equipment and Materials

DESCRIPTION	PART NO.
R Ground electrical power source to supply 200V.3 phase, 400 Hz with a fourth neutral wire	-
R Test set	TE 5101
R Test meter	-

B. Prepare

It is assumed that the motor has been removed from the aircraft, or is disconnected mechanically and electrically from the drive system.

C. Adjustment

(1) Connect the MOTOR receptacle on the test set to the receptacle on the motor.

(2) Connect the test set SUPPLY receptacle to a 3 phase, 200 V, 400Hz power source with a fourth neutral wire.

CAUTION: DO NOT OPERATE THE MOTOR MORE THAN ONE CYCLE OF OPERATIONS IN TWO MINUTES.

(3) With no load on the motor, select "OPEN" on the MOTOR switch and press the INCHING CONTROL button until the motor stops. Check that the motor switches off correctly.

(4) Select "SHUT" on the MOTOR switch and press the INCHING button until the motor stops. Check that the motor switches off correctly.

(5) Remove the test set.

(6) Fit cover blanks to the drive and electrical receptacles on the motor.

(7) The motor may now be installed in the aircraft,

or reconnected to the system.

R 3. Test - To Check the Motor Braking Revolutions

NOTE: This test is associated with fault analysis and is not required on a new motor.

A. Equipment and Materials

DESCRIPTION	PART NO.
Ground electrical power source to supply 200V 3 phase, 400Hz within fourth neutral wire	-
Test set	TE 5101
Test meter	-

B. Prepare

NOTE: It is assumed that the motor has been removed from the aircraft, or is disconnected mechanically and electrically from the drive system, and has been run shut before disconnection from the drive system. That is to say the motor is in the 'run shut with system drag' condition.

C. Test

(1) Connect the test meter across pins A and C on the motor receptacle. The test should show open circuit.

(2) Using a handwinding tool on the motor drive, rotate the drive clockwise counting the revolutions, until the meter shows continuity (shut micro-switch closed). Stop and record the revolutions.

(3) Rotate the motor drive counter-clockwise, counting the revolutions, until the meter shows open circuit (shut micro-switch open). Stop and record the revolutions.

(4) Subtract the revolutions recorded in operation (3) from those recorded in operation (2). The result equals braking revolutions 'A'.

(5) Disconnect the test meter from the motor.

(6) Using the test set as described in para.2 run the motor open and shut, pause for the CAUTION, then run open and shut again. Remove the test set.

NOTE: The motor will now be in the 'bench run shut condition'.

(7) Repeat operations (1), (2) and (3).

(8) Subtract the revolutions recorded in operation (3) from those recorded in operation (2). The result equals braking revolutions 'B'.

(9) Compare braking revolutions 'A' with 'B'. 'A' should equal between 'B'-5 to 'B'-3 revolutions.

NOTE: 1. A new motor should have a 'bench run to shut' braking run of between 12 to 14 revolutions.

2. A motor should be capable of repeating this test with no variation in the recorded revolutions.

SCREWJACK (SECONDARY AIR DOOR) - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS IN 24-00-00.

1. General

Four screwjacks are fitted in the secondary air ducts of each engine air intake, forward of the fireproof bulkhead. Access to the jacks is from the secondary air door apertures, with the doors either open or removed. Access to these doors is obtained by opening the engine bay forward door. Access to the top screwjack nearest the engine bay centre wall, also requires the removal of the engine air intake rings (Ref.71-21-11).

2. Screwjacks

A. Equipment and Materials

	DESCRIPTION	PART NO.
	Circuit breaker safety clips	-
	Torque spanner range:	
	25-30 lbf in (0.28-0.34 mdaN)	-
R	50-60 lbf in (0.56-0.68 mdaN)	-
	Torque limiting screwdriver range:	
R	25-30 lbf in (0.28-0.34 mdaN)	-
	Test Set	TE 5101
	Screwjack key	D925407000
	Corrosion resistant steel wire	
R	0.031 in (0.8mm) dia.	DTD 189
	Sealant (Ref.20-30-00, No.351)	-

B. Prepare to Remove Screwjack

(1) Open the appropriate engine bay forward door (Ref. 71-00-00, Servicing).

(2) Trip the appropriate additional circuit breakers and secure them with safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine No.1			
R SEC AIR DOOR MTR SUP	2-313	1K247	C10
R SEC AIR DOOR POSN IND	1-213	1K238	F 2
Engine No.2			
R SEC AIR DOOR MTR SUP	2-213	2K247	F10
R SEC AIR DOOR POSN IND	5-213	2K238	C 3
Engine No.3			
R SEC AIR DOOR MTR SUP	4-213	3K247	A19
R SEC AIR DOOR POSN IND	5-213	3K238	C 4
Engine No.4			
R SEC AIR DOOR MTR SUP	4-213	4K247	F19
R SEC AIR DOOR POSN IND	1-213	4K238	F 3

(3) Remove the forward and aft intake rings (Ref. 71-21-11) if the screwjack for the top door nearest the engine bay centre wall is to be removed.

C. Remove Screwjack (Ref. Fig. 401)

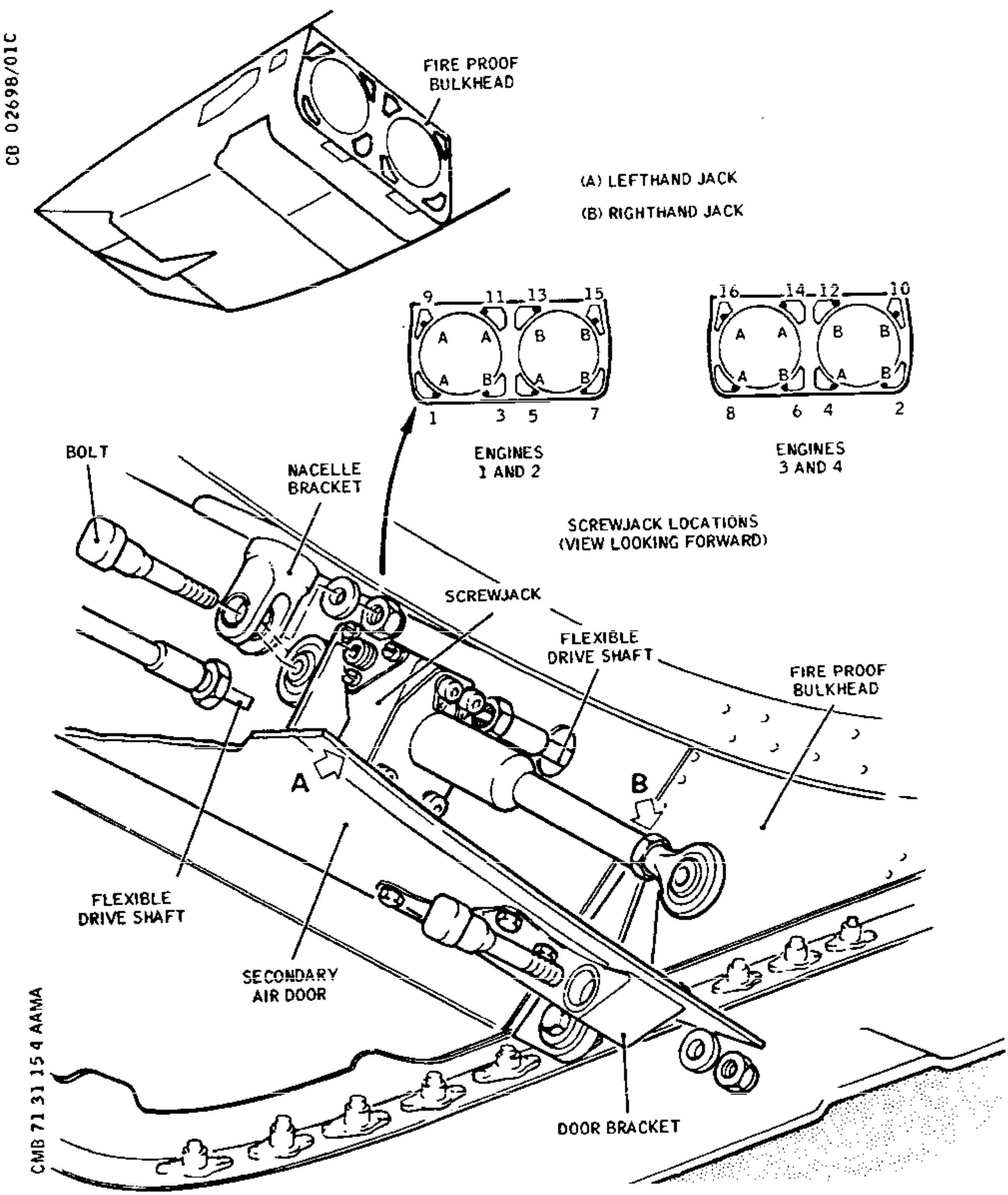
(1) Set the drive system to the shut datum position as detailed in Secondary Air Doors Adjustment (Ref. 71-31-00, Adjustment/Test).

(2) Remove the sealant covering and the bolt securing the screwjack to the door and open the door.

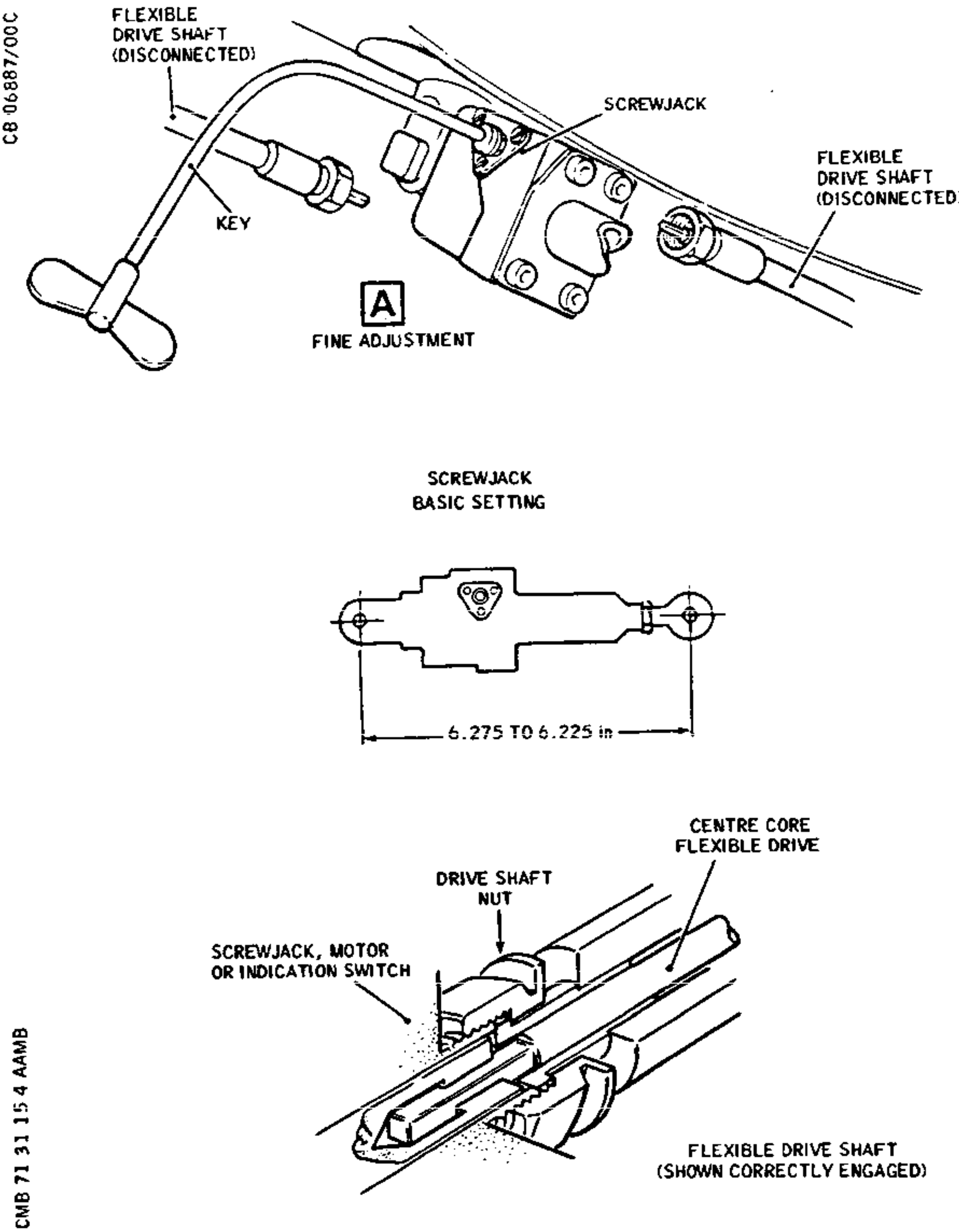
NOTE: On the screwjacks associated with doors 9, 10, 15 and 16 (top outboard) the screwjack bolt is inaccessible with the door closed; the bolt can be removed in accordance with instruction in 71-31-12, Removal/Installation).

R (3) Unscrew the nuts securing the flexible drive-shafts to the screwjack; disconnect the shafts from the screwjack.

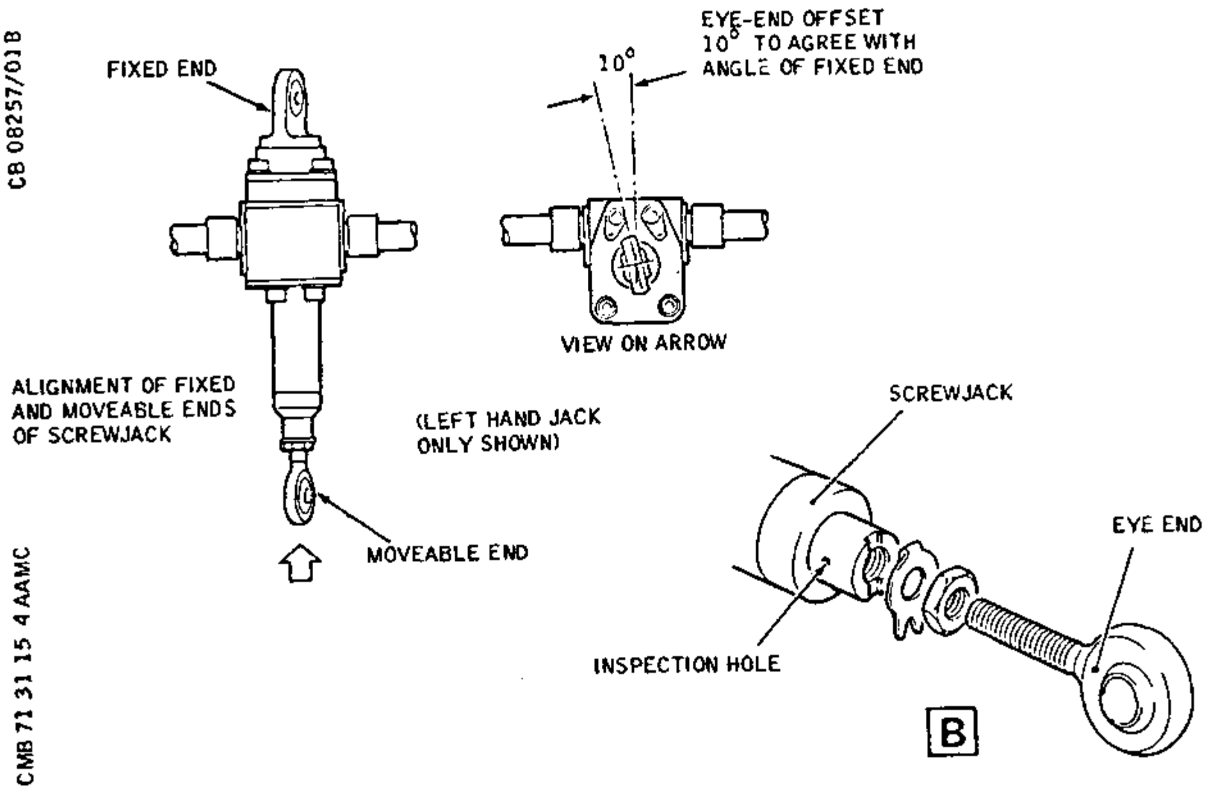
NOTE: If necessary for improved access the secondary air door may be removed (Ref.71-31-12, Removal/Installation).



Screwjack - Installation (Sheet 1 of 3)
Figure 401



Screwjack - Installation (Sheet 2 of 3)
Figure 401



Screwjack - Installation (Sheet 3 of 3)
Figure 401

(4) Support the screwjack, remove the bolt securing the screwjack to the nacelle bracket; remove the screwjack.

(5) Blank off the screwjack drive apertures.

R CAUTION: DO NOT TURN THE DRIVE-SHAFTS.

(6) If a replacement screwjack is to be fitted, remove the eye-end, locknut and tabwasher from the screwjack. Retain these items for use on the replacement screw-jack.

D. Prepare to Install Screwjack

NOTE: Screwjacks are handed, the handing being determined by the angle of the fixed end of the jack.

(1) Comply with the electrical safety precautions.

(2) Remove the blanks from the drive apertures of the jack.

(3) Fit a new tabwasher to the screwjack eye-end.

NOTE: Bend the lug of the tabwasher before fitting to the jack (Detail B).

E. Install - Not Top Outboard Screwjack (Ref. Fig. 401)

NOTE: If all the screwjacks are being replaced use the system datum setting procedure (Ref.71-31-00, Adjustment/Test).

Torque load bolts (Ref. 20-21-11).

Wirelock nuts/bolts (Ref. 20-21-13)

Lock nuts with tab washers (Ref. 20-21-17).

Encapsulate nuts and bolts with Viton (Ref. 20-22-19).

R B (1) Using the screwjack key or SIMILAR turn the screwjack drive until the fully retract stop is reached. Then turn the screwjack drive 20 revolutions from the retract stop. The screwjack is now in the shut datum position.

R B NOTE: Screwjacks on receipt from stores should be set in the fully retracted position.

(2) Loosely assemble a locknut, tabwasher and eye-end to the screwjack. Bend the lug on the tab washer before installation (Detail B).

(3) Screw in the eye-end until the basic setting of 6.275 to 6.225 in is achieved.

(4) Support the screwjack in position by installing the bolt, washer and nut in the nacelle bracket and R torque-tighten to between 50 and 60 lbf in (0.57 and 0.68 mdaN).

(5) If necessary install the secondary air door (Ref. 71-31-12, Removal/Installation).

(6) Set the secondary air door clearance (Ref.71-31-00, Adjustment/Test).

R (7) Connect the flexible drive-shafts to the screwjack.

CAUTION: DO NOT DISTURB THE EQUIPMENT SETTINGS.

(a) Engage the square ends of the shafts with the drive sockets on the screwjack (Ref.Detail A).

NOTE: Ensure that the centre core of the flexible drive remains engaged with the equipment.

R (b) Secure the drive-shafts to the screwjack.

R R R (c) Torque-tighten the flexible drive-shaft union nuts to between 40 and 65 lbf in (0.45 and 0.73 mdaN) and wire-lock to the screwjack tabs.

(8) When the screwjack adjustment is satisfactory, set the eye-end to align with the 10 ° offset bearing at the forward end of the screwjack.

R (9) Torque-tighten the locknut to between 25 and 30 lbf in (0.28 - 0.34 mdaN) and lock the tabwasher (Ref. 20-21-17).

(10) Check that the inspection hole in the jack is blocked by the threads of the eye-end.

(11) Fill the undercut and protruding thread of the eye-end with sealant (Ref.20-22-12).

NOTE: Ensure that the face of the eye-end locknut is free of sealant.

R R (12) Torque-tighten the screwjack door bolt to between 50 and 60 lbf in (0.57 and 0.68 mdaN).

F. Install Top Outboard Screwjack (Ref. Fig. 401)

NOTE: Torque load bolts (Ref. 20-21-11).

Wirelock nut/bolts (Ref. 20-21-13).

Lock nuts with tab washers (Ref. 20-21-17).

Encapsulate nuts and bolts with Viton (Ref. 20-22-19).

R B R B R B R B R B (1) Using the screwjack key or similar, turn the screwjack drive until the fully retract stop is reached. Then turn the screwjack drive 20 revolutions from the retract stop. The screwjack is now in the shut datum position.

R B R B NOTE: Screwjacks on receipt from stores should be set in the fully retracted position.

(2) Loosely assemble a lock nut, tabwasher and eye-end to the screwjack. Bend the lug on the tab-washer before fitting to the jack (Detail B).

(3) Screw in the eye-end until the basic setting of 6.27 in (159.20 mm) is achieved.

(4) Support the screwjack in position by installing the bolt washer and nut in the nacelle bracket.
R Torque-tighten to between 50 and 60 lbf in (0.57 and
R 0.68 mdaN).

R (5) Install the flexible drive-shafts in the screwjack.

<u>CAUTION</u>: DO NOT DISTURB THE EQUIPMENT SETTINGS.

(a) Engage the square ends of the shafts with the drive sockets of the screwjack (Ref.Detail A).

<u>NOTE</u>: Ensure that the centre core of the flexible drive remains engaged with the equipment.

R (b) Secure the drive-shafts to the screwjack and
R torque-tighten the union nuts to between 40
R and 65 lbf in (0.45 and 0.73 mdaN) and wire-lock to the screwjack.

(6) If necessary install the secondary air door (Ref. 71-31-12, Removal/Installation). Open the secondary air doors using the test set (Ref.71-31-00, Adjustment/Test).

<u>NOTE</u>: Ensure that the screwjack ram causes no damage.

(7) Temporarily insert the screwjack door bolt.

(8) Close the secondary air doors, using the test set, check, open and adjust the door setting (Ref.71-31-00, Adjustment/Test); repeat as necessary.

(9) When the screwjack adjustments are satisfactory set the eye-end to align with the 10 ° offset bearing at
R the forward end of the screwjack.

R (10) Torque-tighten the eye-end locknut to between 25 and
R 30 lbf in (0.28 - 0.34 mdaN) and lock the tabwasher (Ref. 20-21-17).

(11) Check that the inspection hole in the jack is blocked by the threads of the eye-end.

(12) Fill the undercut and protruding thread of the eye-end with sealant (Ref.20-22-12).

<u>NOTE</u>: Ensure that the face of the eye-end locknut

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is free of sealant.

R (13) Torque-tighten the nut and bolt securing the screwjack
R to the door to between 50 and 60 lbf in (0.57 and
R 0.68 mdaN).

G. Conclusion

(1) Functionally test the secondary air doors (Ref. 71-31-00, Adjustment/Test).

(2) Disconnect the test set and reconnect the aircraft electrical plugs to the motor and indication switch unit.

(3) Encapsulate all nuts and bolts, except the drive shaft union nuts, with sealant (Ref. 20-22-19).

(4) Ensure that the area is clean.

(5) Replace the intake rings (Ref. 71-21-11), if these have been removed.

(6) Remove the safety clips and set the additional circuit breakers previously tripped.

(7) Carry out the operational test on the secondary air doors (Ref. 71-31-00, Adjustment/Test).

(8) Close the engine bay forward door (Ref. 71-00-00, Servicing).

(9) Check that the area is clean. Close and lock the motor access panel (411NB). Torque-tighten the
R fasteners to between 25 and 30 lbf in (0.28 -
0.34 mdaN).

INDICATION SWITCH UNIT (SECONDARY AIR DOOR) - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00

1. General

An indication switch unit is located in the nacelle structure at the rear of each engine air intake and is accessible from a panel on the underside of the intake.

2. Switch Unit

A. Equipment and Materials

	DESCRIPTION	PART NO
	Circuit breaker safety clips	-
R	Torque spanner range: 40-65 lbf in (0.45 - 0.73 mdaN) 70-80 lbf in (0.79 - 0.90 mdaN)	-
R	Torque limiting screwdriver range: 25-30 lbf in (0.28 - 0.34 mdaN)	-
R	Corrosion resistant steel wire 0.031 in (0.8 mm) dia	DTD189
	Viton sealant (Ref. 20-30-00,No 351)	-

B. Prepare

(1) Ensure that the secondary air doors are fully closed in the shut datum position:

(a) Open the engine bay doors (Ref. 71-00-00, Servicing).

(b) Visually check that the secondary air doors are shut.

R NOTE: A check on the two bottom doors should be
R sufficient for this purpose. If, however,
R access is required to the top doors, the

intake rings will have to be removed (Ref. 71-21-11, Removal/Installation).

The doors will normally be closed on the ground; if this is not the case the fault must be isolated and the doors closed fully before proceeding with the switch change.

(2) Trip the appropriate additional circuit breakers and secure with safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
ENGINE NO. 1			
SEC AIR DOOR MTR SUP	2-213	1K247	C10
SEC AIR DOOR POSN IND	1-213	1K238	F2
ENGINE NO. 2			
SEC AIR DOOR MTR SUP	2-213	2K247	F10
SEC AIR DOOR POSN IND	5-213	2K238	C3
ENGINE NO. 3			
SEC AIR DOOR MTR SUP	4-213	3K247	A19
SEC AIR DOOR POSN IND	5-213	3K238	C4
ENGINE NO. 4			
SEC AIR DOOR MTR SUP	4-213	4K247	F19
SEC AIR DOOR POSN IND	1-213	4K238	F3

(3) Open the motor access panel.

(4) Remove the Viton sealant from the C-clip and switch securing bolts.

C. Remove (Ref. Fig. 401)

(1) Loosen the nut retaining the flexible drive-shaft to the switch unit; disconnect the drive from the switch unit.

(2) Disconnect the electrical plug from the receptacle on the switch unit.

(3) Remove the bolt from the switch bracket on the aft face of the bulkhead, in the engine bay. Support

the switch unit and remove the remaining two bolts securing the unit and bracket assembly. Remove the complete assembly through the access panel aperture.

R (4) Fit blank covers to the switch unit and the drive-shaft.

D. Prepare to Install

R B NOTE: Switch units are set in the workshops to the DATUM SHUT position. The aircraft secondary air door system must be put in the DATUM SHUT position before the switch unit is fitted to the aircraft. DO NOT TURN THE DRIVE SHAFT OF A SWITCH UNIT RECEIVED DIRECT FROM STORES. If this happens, the switch unit MUST be repositioned in the DATUM SHUT position IAW MM 71-31-16 Page 501. No mechanical resistance will be felt when the switch unit is over-travelled by hand to the point that the drive shaft pin shears.

(1) Comply with the electrical safey precautions.

(2) Remove the blank covers from the switch unit and
R drive-shaft.

(3) Ensure that the switch unit is in the shut datum position indicated by the position indicator visible through the indicator window on the switch body.

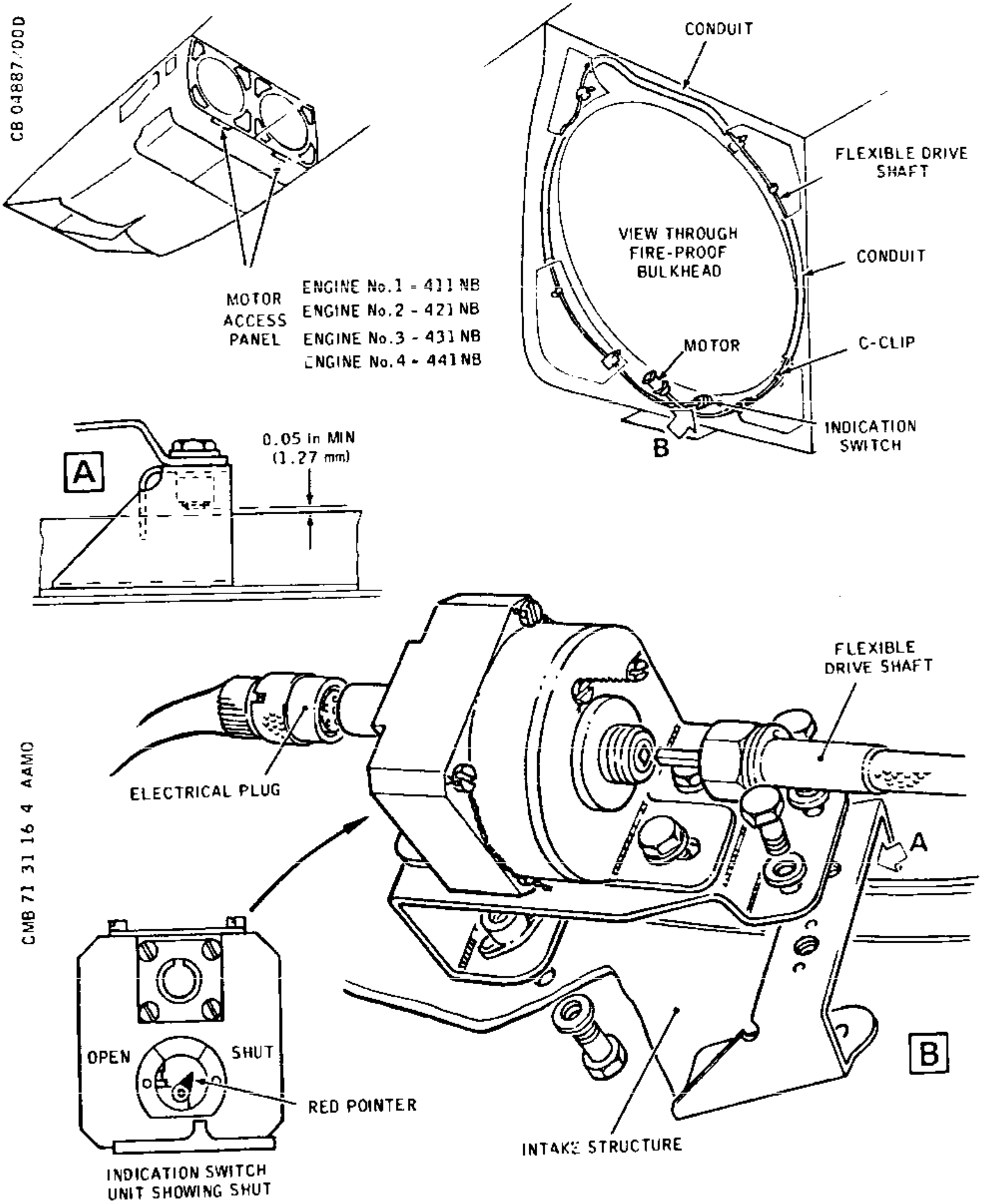
R NOTE: A new switch will be received set to the SHUT datum and labelled accordingly.

R If a switch has been removed in an intermediate position or if there is any
R reason to doubt the switch setting, set the switch to the SHUT datum (Ref.71-31-16, Adjustment/Test).

(4) When a replacement switch unit is to be installed, remove the existing unit from its bracket and secure the new switch unit to the bracket:

(a) Remove the four bolts securing the switch unit to its mounting bracket.

(b) Secure the replacement switch unit to its mounting bracket with washers and bolts.
R Torque-tighten each bolt to between 70 and 80



R

Indication Switch Unit
Figure 401

R lbf in (0.79 and 0.90 mdaN) and lock adjacent bolt heads together with wire.

R (5) When a new bracket is to be installed, mark out the anchor nut positions to suit the assembly, drill as required and rivet the anchor nuts in position. Restore surface treatment as necessary.

(6) Check that the secondary air doors are still in the shut datum position.

E. Install Switch Unit (Ref. Fig. 401)

CAUTION: DO NOT TURN THE INDICATION SWITCH SHAFT OR
R THE FLEXIBLE DRIVE-SHAFT DURING INSTALLATION.

R NOTE: Torque-tighten bolts (Ref. 20-21-11).

R Wire-lock nuts and bolts (Ref. 20-21-13).

Encapsulate nuts and bolts with Viton (Ref. 20-22-19).

(1) Locate the switch unit and bracket assembly on the bulkhead and secure the bracket with bolts and washers; two from the forward side and one from the rear of the bulkhead.

R (2) Torque-tighten the bolts to between 70 and 80 lbf in (0.79 and 0.90 mdaN) and wire-lock the two bolts forward of the bulkhead.

(3) Check that there is a minimum gap of 0.05 in (1.27 mm) between the switch unit bolts and the mount-
R ing (Ref. Detail A).

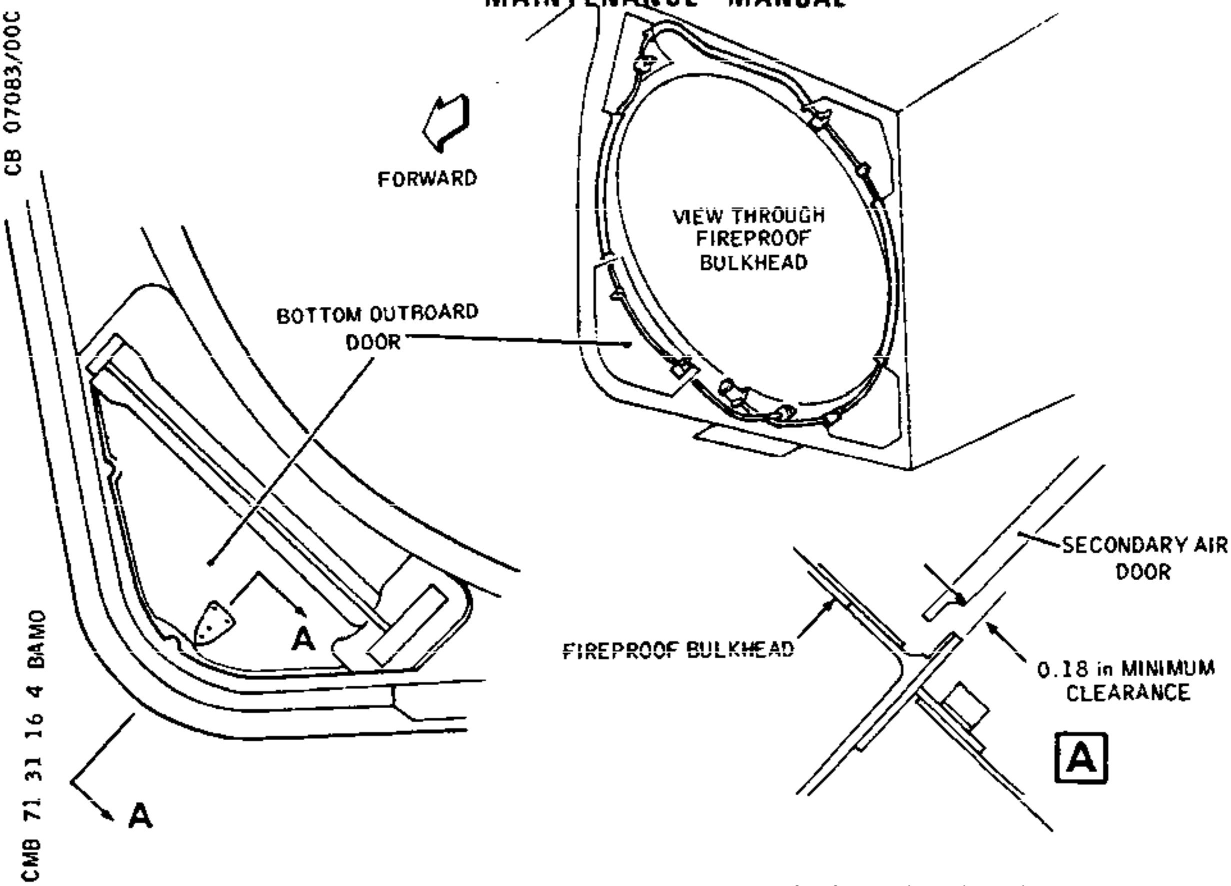
(4) Engage the flexible drive-shaft with the switch unit and tighten the shaft nut to between 40 and 65 lbf in
R (0.45 and 0.73 mdaN). Lock the end of the drive-shaft to the hole in the switch unit with wire.

(5) Carry out the additional check to ensure correct functioning of the switch unit (Ref. Fig. 402):

CAUTION: DO NOT OPERATE THE DOORS MORE THAN ONE CYCLE OF OPERATION IN TWO MINUTES.

(a) Connect the test set (Ref. 71-31-00, Adjustment/ Test).

(b) Using the test set, inch the doors towards



Indication Switch Unit - Additional Check
Figure 402

SHUT. Stop immediately when the INDICATION MICRO-SWITCH SHUT S/W red light illuminates.

(c) Measure the distance between the aft face of the door and the aft face of the door sealing angle (Detail A); this is to be a minimum of 0.18 in (4.57 mm).

R (6) Functionally test the secondary air doors (Ref. 71-31-00, Adjustment/Test). Do not close the engine bay doors or access panel at this stage.

R (7) Encapsulate the switch and C-clip securing bolts in Viton (Ref. 20-22-19).

F. Conclusion

(1) Ensure that the area is clean; close and lock the
R motor access panel. Torque-tighten the fasteners to 30 lbf in (0.34 mdaN).

R (2) Remove the safety clips and reset the additional

circuit breakers previously tripped.

(3) Operationally test the secondary air doors (Ref. 71-31-00, Adjustment/Test).

(4) Check that the area is clean, close and lock the engine bay doors (Ref. 71-00-00, Servicing).

INDICATION SWITCH UNIT (SECONDARY AIR DOORS) - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

This topic describes the datum shut position, and includes a partial function test and an operational test. The test given is for the switch unit in No.1 intake; the test for other switch units is similar.

R B Switch units are set in the workshops to the DATUM SHUT
R B position. The aircraft secondary air door system must be put
R B in the DATUM SHUT position before the switch unit is fitted to
R B the aircraft. DO NOT TURN THE DRIVE SHAFT OF A SWITCH UNIT
R B RECEIVED DIRECT FROM STORES. If this happens, the switch unit
R B MUST be repositioned in the DATUM SHUT position IAW Paragraph
R B 2. Adjustment. No mechanical resistance will be felt when the
R B switch unit is over-travelled by hand to the point that the
R B drive shaft pin shears.

2. Adjustment - To Set the SHUT Datum (Ref. Fig. 501)

A. Equipment and Materials.

DESCRIPTION	PART NO.
Ground electrical power Source to supply 200V, 3 phase, 400 Hz with a fourth neutral wire.	
Test set	TE5101

B. Prepare

It is assumed that the switch unit has been removed from the aircraft, or is disconnected mechanically and electrically from the drive system.

C. Adjustment.

(1) Connect the INDICATION RECEPTACLE on the test set to the receptacle on the indication switch unit.

(2) Connect the test set SUPPLY receptacle to a 3 phase,

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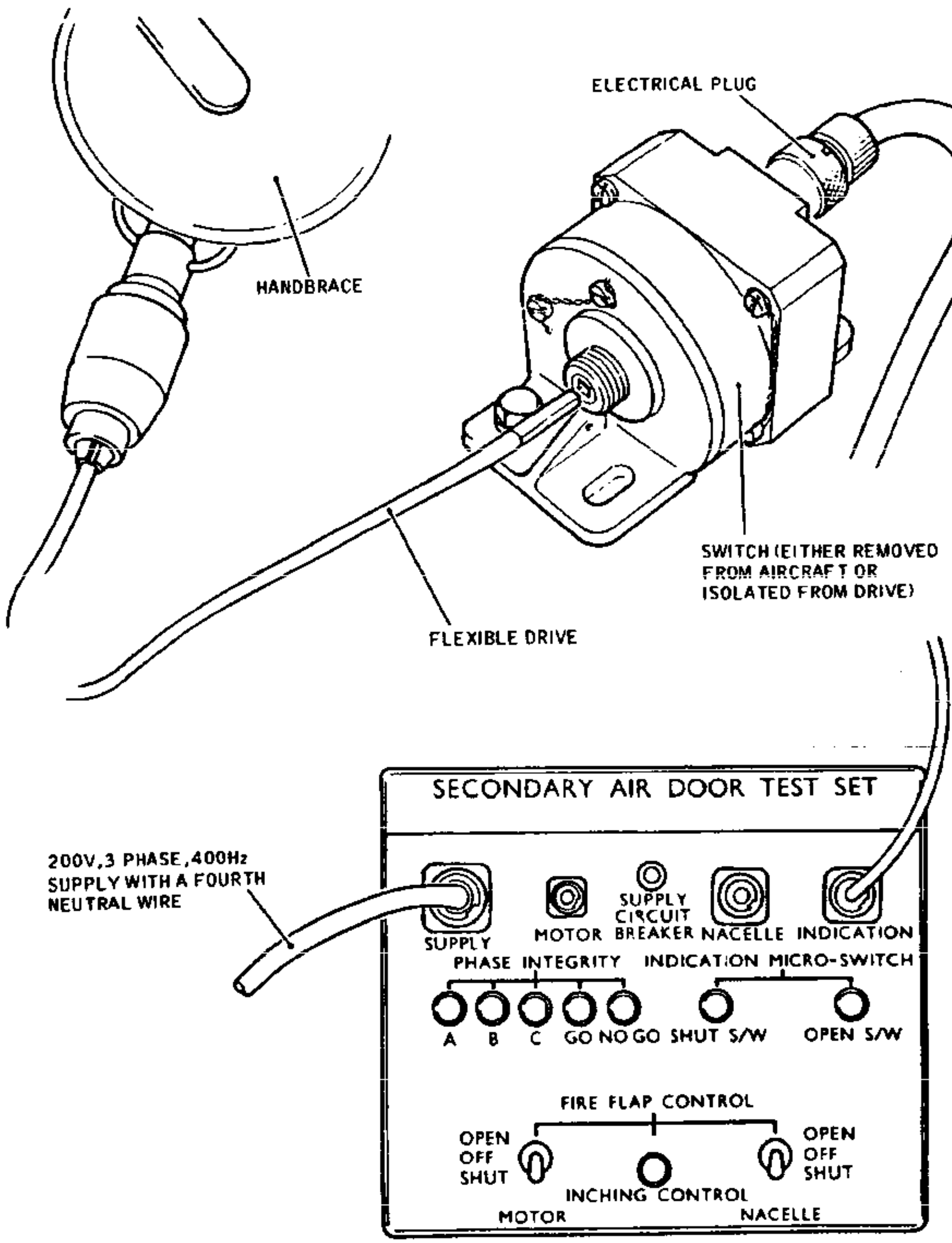

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Indication Switch Unit - Setting
Figure 501

200V, 400 Hz power source with a fourth neutral wire.

(3) Check that the test set indication microswitch lamp SHUT S/W light is ON.

(4) Turn the switch input shaft anti-clockwise until the SHUT S/W light goes out. Stop and turn in the opposite sense until the SHUT S/W light relights, continue to turn a further 55 revolutions in the same direction then stop.

NOTE: The SHUT direction of rotation is clockwise viewed from the input shaft of the indication switch unit.

(5) Remove the test set.

(6) Fit cover blanks to the drive and electrical receptacles on the switch unit.

(7) The switch unit may now be installed in the aircraft, or reconnected.

D. Conclusion

(1) Functionally test the system (Ref.71-31-00, Adjustment/Test).

(2) Switch off and disconnect electrical ground power (Ref. 24-41-00).

END OF THIS SECTION

NEXT

POWER PLANT HEAT SHIELDS - DESCRIPTION AND OPERATION

1. General (Ref. Fig.001 and Fig.002)

Heat shields protect the wing structure, power unit supports and connections against fire, high engine bay temperatures and combustion chamber torching flame. They also protect equipment mounted in the engine bays and prevent fire passing between adjoining engine bays.

After SB 71-076

Temperature sensitive wires on the firewall sidewall plates indicate hot air leaks (Ref. 71-32-17).

Heat shields comprise: the Underwing Firewall that consists of insulated panels that form the roof of the engine bays. Tantalum heat shields used to reinforce the underwing firewall above the engine combustion chamber and Secondary heat shields that enclose services and fittings in the engine bays and the cornice at the top of the engine bay outer and centre wall. All heat shields are of equal importance in protecting the structure and equipment in and around the nacelle.

In addition, there are engine-mounted heat shields that include those around the combustion chamber outer casing and the exhaust diffuser.

Heat shields, in the form of a number of panels with a gold plated finish, surround the rear of the engine and protect engine components and the aircraft nacelle from engine heat radiation. The heat shields around the combustion chamber outer casing (CCOC) are attached to the engine by brackets bolted to the CCOC front and rear flanges and form one group. Rearward of the CCOC a second group of heat shields are located around the exhaust diffuser and spherical joint flange. These are attached to the engine by brackets bolted to the blade containment shield, the exhaust diffuser casing and rear flange are supplemented by brackets riveted to the spherical joint flange.

2. Underwing Firewall (Ref. Fig.001)

The underwing firewall is made up of twenty-two panels. The panels are clamped to wing brackets by lateral and longitudinal straps using screwpins and self-locking nuts. Various cut-outs in these panels accommodate fuel, hydraulic, hydraulic tank pressurization pipes, air conditioning ducts and other services to and from the engine. For this reason only a limited number of the panels are interchangeable.

Generally, each panel consists of a glass cloth covered layer of Min-K insulation stiffened by a stainless steel support tray and sealed to form a fluid tight panel. The top surface of the panel has an anti-fretting layer of Xylan 1010 (PTFE) which is in contact with the wing skin. Flame proof breather assemblies, approximately two per panel, prevent large air pressure variations that would tend to buckle the panels, the panels are electrically bonded by steel ferrules. The foremost panel is different from the other panels in that it comprises a layer of insulation totally enclosed by a stainless steel skin.

Firewall panels situated above the engine compressors consist of primary heat shields that extend from spar 64 to spar 68. The shields at spar 64 are cross corrugated for acoustic purposes and are coated with Viton-impregnated fibreglass. Those shields from spar 66 to spar 68, including a two-inch overlap with the torching flame barrier, are reinforced by laminations of graphite cloth and phenolic resin secured to the steel tray by adhesive. The cloth acts as a debris shield to prevent penetration of the firewall by molten titanium during a titanium fire.

Before SB 26-014 and SB 71-075

3. Tantalum Heat Shields (Ref. Fig.001)

Five torching flame heat shields are mounted on the engine bay structure around the combustion chamber. Each heat shield consists of a disilicide coated tantalum plate backed by Durestos board. The top plate heat shield is bolted to Z-members below the firewall panels, spacers are used to create an air gap between the tantalum plate and the firewall. The centre wall top plate and side plate heat shields are bolted to top plate brackets and to the centre and sidewalls respectively. The door shield is bolted to brackets mounted on the sidewall structure and finally the centre wall heat shield is bolted to the engine bay centre wall immediately aft of the joint between the forward and rear centre wall panels.

4. Stainless Steel Heat Shields (Ref. Fig.001)

After SB 26-014

Two additional heat shields consist of stainless steel plates coated with zirconium oxide. These are bolted through the engine bay centrewall immediately aft of the joint between the forward and rear centrewall panels and are fitted above and below the centrewall tantalum heat shield.

After SB 71-075

Door shield and side plate heat shields consist of stainless steel plate coated with zirconium oxide and are fitted in place of the appropriate tantalum heat shields utilizing existing mountings.

5. Secondary Heat Shields (Ref. Fig.001)

Secondary heat shields are fitted where pipes and electrical cables enter the engine bay from the wing and at the upper longitudinal edges of each engine bay where they protect the joint on the engine bay centrewall, the engine and twin secondary nozzle thrust and drag struts, electrical looms and other fittings.

A typical secondary heat shield consists of a layer of micro-quartz or Min-K insulation between an inner and outer skin of stainless steel. A breather hole is provided in the outer skin. Cornice heat shields at the top of the engine bay centrewall also include a rubber seal on the edges that abut the centrewall to prevent the heat shield fretting against the centrewall honeycomb. A separate seal arrangement built into the centrewall prevents airflow between the engine bays to stop fire spreading to the adjacent engine.

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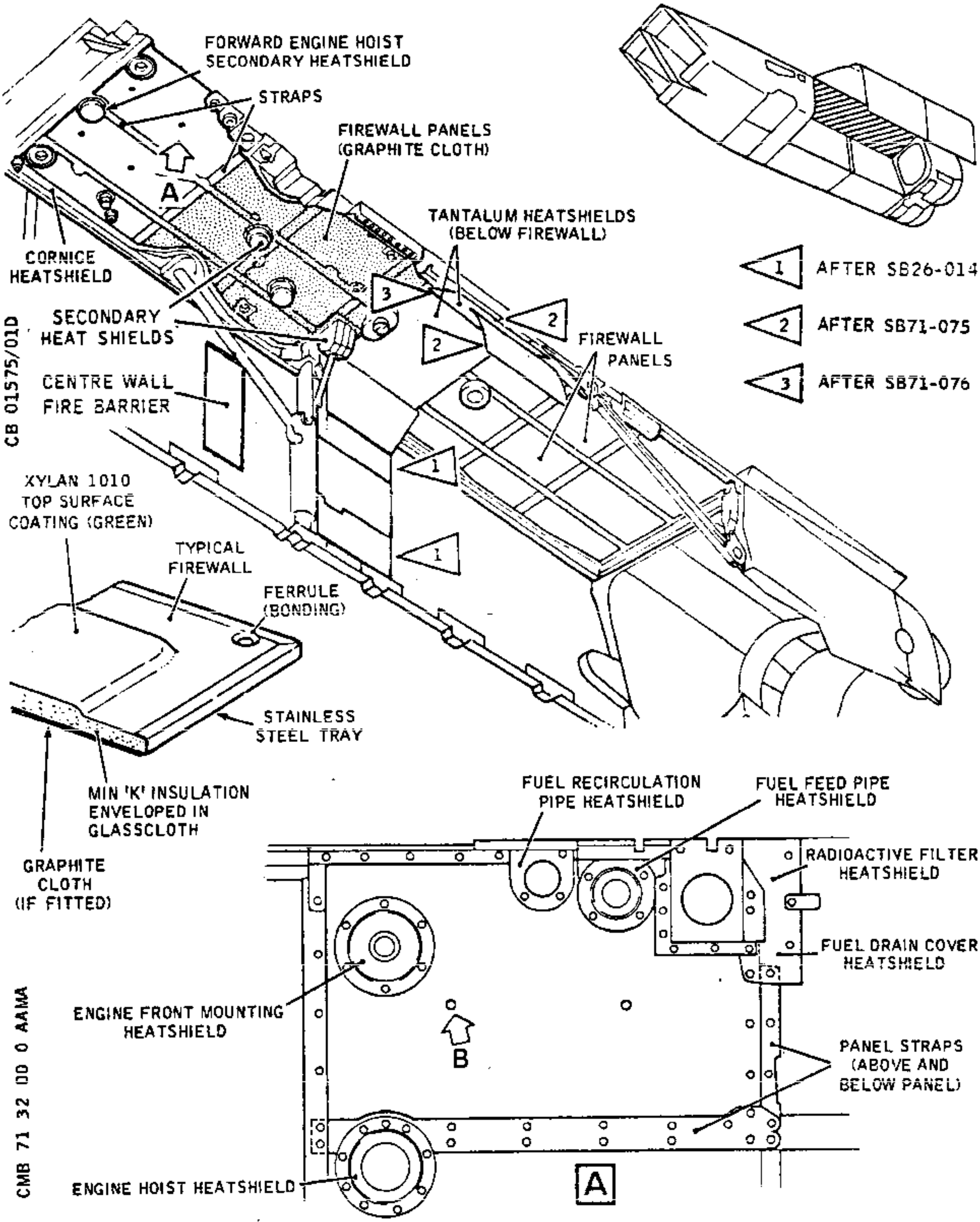
After SB 71-072

6. Centrewall Fire Barrier

A single panel is mounted on the forward centrewall in each engine bay to provide protection of the structure in the event of an uncontained titanium fire in the vicinity of the HP2 and HP3 compressor stages. The protection consists of an encased layer of insulation material faced with phenolic resin impregnated carbon cloth.

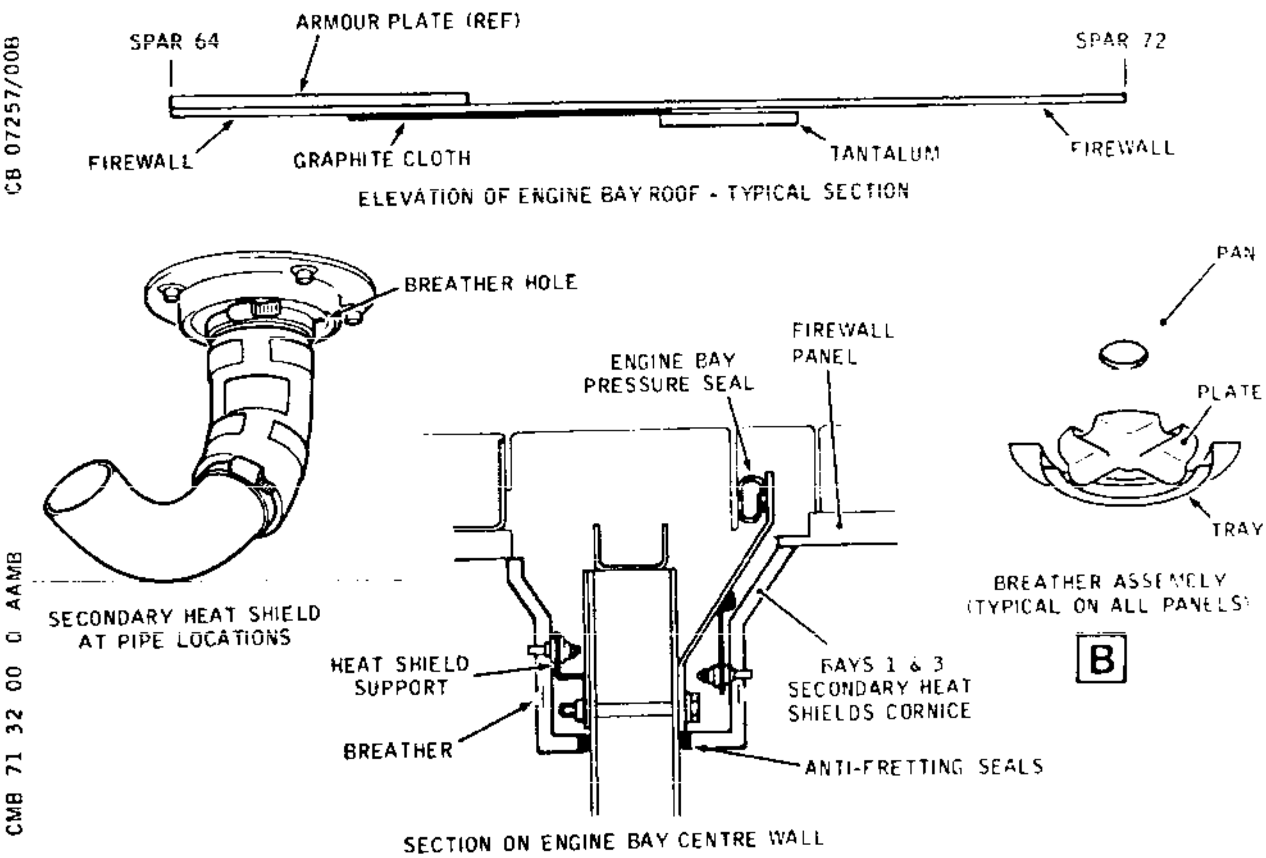
7. Combustion Chamber Outer Casing Heat Shields

The panel sections shielding the CCOC consist of a heat shield and rear cover, both of which are in two panels, right-handed and left-handed and not interchangeable. Spaces and contours are provided in the heat shield panels to cater for projections such as the engine externally mounted components. Where the two heat shield panels join, they are bolted together by nuts on captive bolts and bolts in captive nuts. At all locations where the panel sections are secured by bolts to the engine mounted brackets, mesh dampers and washers on each side of the panels allow flexibility (Ref. Fig.002). The mesh dampers at the rear of the heat shield panels are integral with their panel sections, while those at the front are not attached. The attachment bolts at the rear of the heat shields also secure the rear cover panels in position.

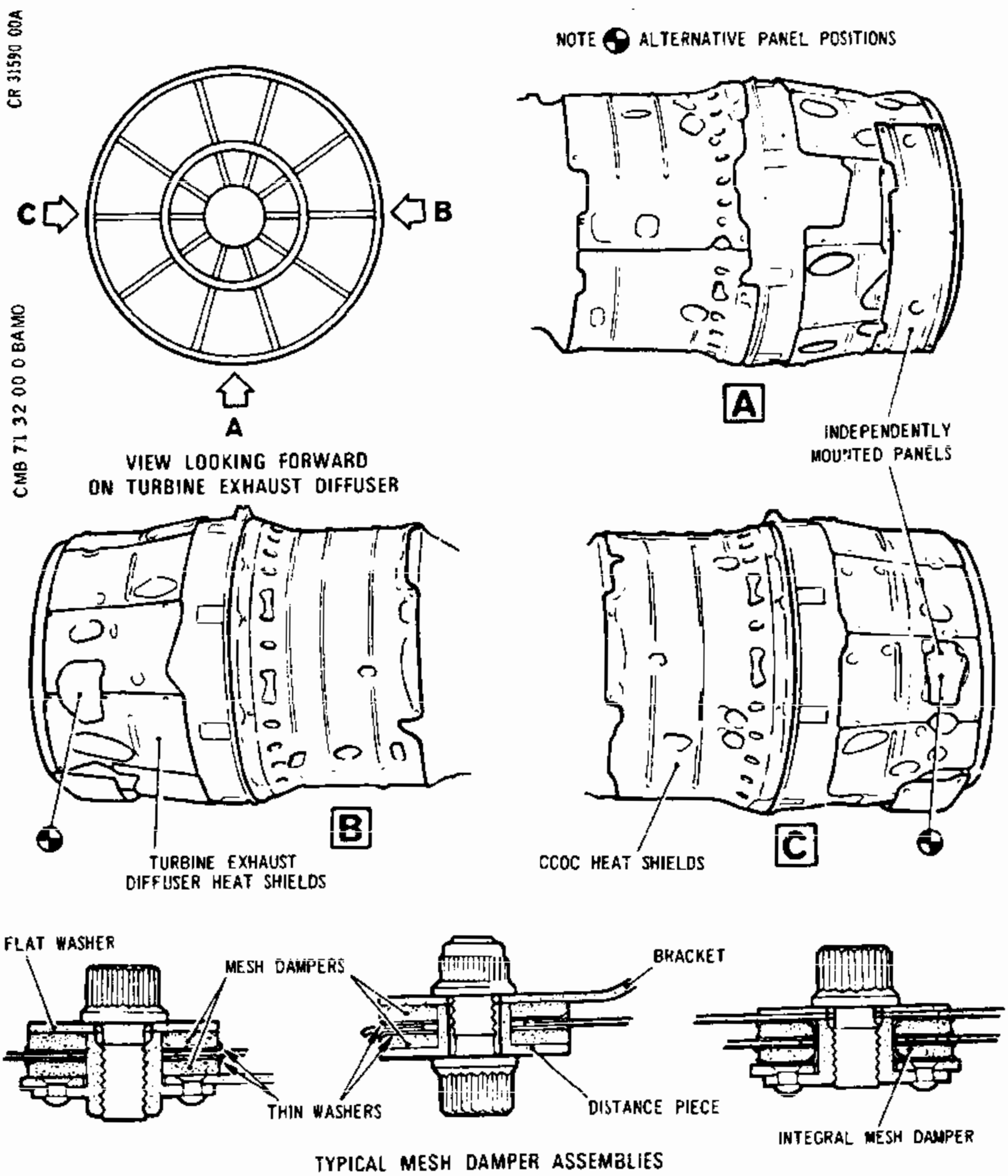


Structure Heat Shields
(Sheet 1 of 2)
Figure 001

R



Structure Heat Shields (Sheet 2 of 2)
Figure 001



Engine Heat Shields
Figure 002

8. Exhaust Diffuser Heat Shields

This group of heat shields consists of twelve panel sections one of which has an alternative mounting position, this position depends upon to which bay the engine is installed in the aircraft nacelle. Spaces and contours are provided in the panel sections to the engine mounted brackets is the same as the CCOC heat shields. Ten of the panel sections are interlocked radially and two, including the panel with an alternative mounting position, are mounted independently. The independently mounted panel with an alternative position is bracket mounted at the alternative location for the nozzle supply tubes and at one of the power pitots, on two engines it is mounted on the right-hand side and on the other two it is mounted on the left-hand side. The other independently mounted panel is attached by bolts to brackets bolted to two of the ten radially interlocked panels, with mesh dampers and washers on each side of the panel, as well as engine mounted brackets.

HEAT SHIELDS - TURBINE EXHAUST DIFFUSER - REMOVAL/INSTALLATION

1. General

Of the twelve heat shield panels, two panel sections are mounted independently for ease of removal and installation during maintenance practices.

One panel, mounted on the left-hand or right-hand side of the engine depending on its position in the nacelle, is secured to a bracket at the alternative location for the nozzle supply tubes and at one of the power pitots.

The removal and installation procedures for the side panel is given in paragraph 3 and those for the lower panel in paragraph 4.

2. Heat Shields

A. Prepare to Remove a Heat Shield.

(1) Open engine bay rear lower door (Ref.71-00-00, Servicing).

3. Heat Shield - Side Mounted (Ref. Fig. 401) (detail A)

A. Remove Heat Shield.

R WARNING: WASH HANDS AFTER CONTACT WITH LUBRICANT G ON
R HEAT SHIELD PANELS. LUBRICANT CONTAINS
R COPPER AND LEAD AND IS TOXIC.

(1) Remove bolts, flat washers, outer mesh dampers and thin washers securing heat shield to spherical joint flange mounted brackets.

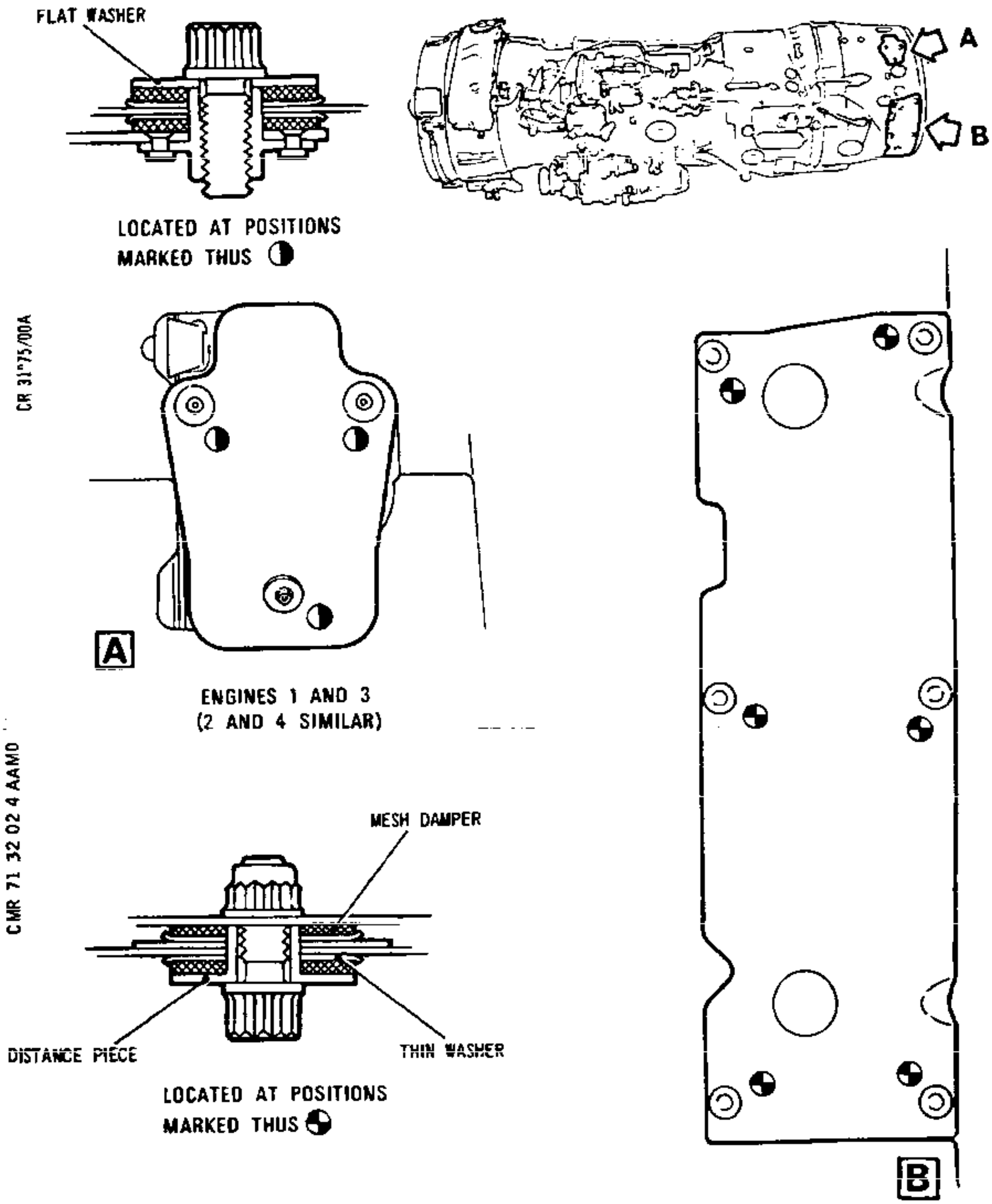
(2) Remove heat shield from engine and inner thin washers and mesh dampers.

B. Install Heat Shield.

R WARNING: WASH HANDS AFTER USING LUBRICANT G. LUBRICANT
R CONTAINS COPPER AND LEAD AND IS TOXIC.

(1) Apply lubricant G to contact surfaces of heat shield and thin washers and lubricant B to bolts (Ref.70-00-01, Servicing and Storage Materials).

(2) Secure heat shield to brackets with three bolts, flat washers, thin washers and mesh dampers as shown. Torque-tighten bolts to between 67 and 73 lbf in.



Heat Shield Location Details
Figure 401

(7,6 and 8,2 N.m).

4. Heat Shield - Lower Panel (Ref. Fig. 401)(detail B)

A. Remove Heat Shield.

R WARNING: WASH HANDS AFTER CONTACT WITH LUBRICANT G ON
R HEAT SHIELD PANELS. LUBRICANT CONTAINS COPPER
R AND LEAD AND IS TOXIC.

(1) Disconnect reheat igniter lead connector from reheat ignition transformer on nacelle centre wall.

(2) Detach igniter lead clamps from reheat ignition transformer on nacelle centre wall.

(3) Remove nuts, bolts, distance pieces, thin washers and mesh dampers securing heat shield to brackets.

(4) Remove heat shield from engine, disengaging igniter lead from panel aperture.

B. Install Heat Shield.

R WARNING: WASH HANDS AFTER USING LUBRICANT G. LUBRICANT
R CONTAINS COPPER AND LEAD AND IS TOXIC.

(1) Apply lubricant G to contact surfaces of heat shield and thin washers and lubricant B to bolts.

(2) Pass igniter lead through aperture in shield.

(3) Secure heat shield (as shown) to brackets on spherical joint flange with bolts, distance pieces,thin washers, mesh dampers and nuts. Torque-tighten nuts and bolts to between 67 and 73 lbf in. (7,6 and 8,2 N.m).

(4) Connect, tighten and wire-lock igniter lead connector to reheat ignition transformer on nacelle centre wall.

(5) Apply lubricant B (Ref.70-00-01,Servicing and Storage Materials) to attachment items and secure igniter lead clamps to the two attachment points on the transformer on nacelle wall with a bolt, flat washer and nut at each location. Torque-tighten bolt and nut to between 50 and 60 lbf in. (5,6 and 6,8 N.m).

5. Complete the Installation

A. Close engine bay door (Ref.71-00-00, Servicing).

HEAT SHIELDS-TURBINE EXHAUST DIFFUSER - INSPECTION/CHECK

1. General

This chapter details acceptable limits of damage to turbine exhaust diffuser heat shields (Ref.para.4.A.). Unacceptable damage is defined in paragraph 4.B.

Details of damage monitoring checks are given in paragraph 5.

2. Terminology for Damage

A. Apply the following definitions to the terms used to describe damage.

(1) Broken. Separated by force into two or more pieces.

(2) Cracked. Visible partial separation of material which may progress to a complete break (Ref.(1) Broken).

(3) Torn. Separation by pulling apart.

3. Examination of Heat Shields

A. Prepare for Examination.

(1) Open engine bay rear doors (Ref.71-00-00, Servicing).

B. Examine Heat Shields.

(1) Inspect heat shield panels for cracks and tears and apply the acceptance standards detailed in paragraph 4.

(2) On completion of the examination close engine bay doors (Ref.71-00-00, Servicing).

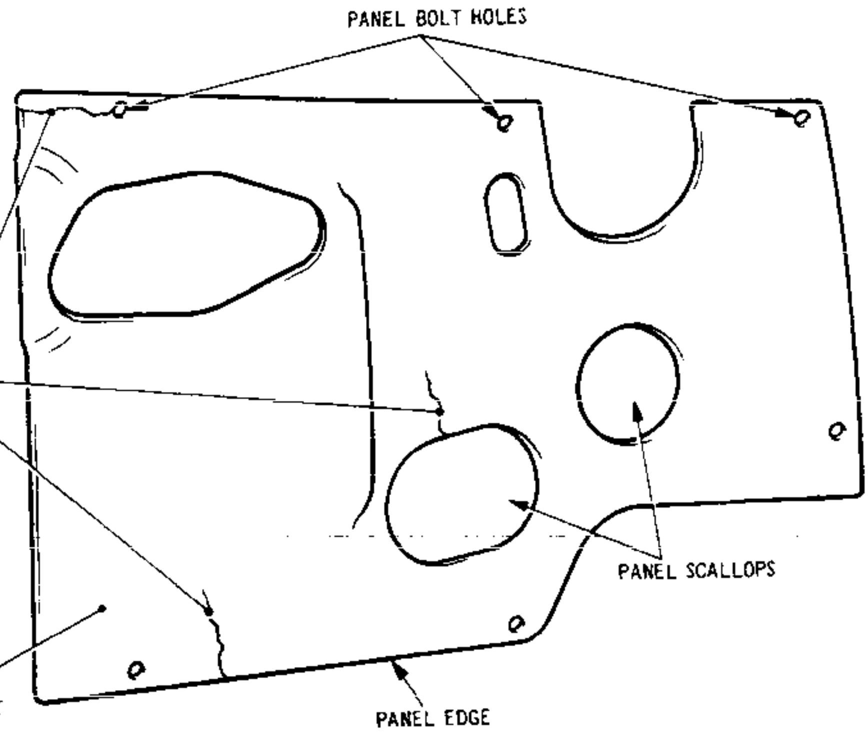
4. Acceptance Standards

A. Acceptable Damage (Ref. Fig. 601)

(1) The following damage to heat shield panels is acceptable for continuation in service:

(a) Cracks from panel scallop and/or panel edge provided that:

(a1) No single crack is longer than 2 in. (50 mm) and,



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Examples of Heat Shield Panel Cracks
Figure 601

(a2) There are not more than three cracks in any single panel and,

(a3) The damage is periodically checked at intervals not exceeding 90 hours of engine flight time.

(b) Cracks from panel bolt-holes provided that:

(b1) No single crack is longer than 2 in. (50 mm) and,

(b2) There is not more than one crack in any single panel and,

(b3) The damage is periodically checked at intervals not exceeding 90 hours of engine flight time.

(c) Cracks as in (a) which result in loss of material provided that:

(c1) The damage area does not exceed 4 sq.in. (2 580 sq. mm) and,

(c2) The heat shield attachment points are not affected and,

(c3) The damage is periodically checked at intervals not exceeding 90 hours of engine flight time.

(d) Cracks as in (a) and (b) which propagate to a length greater than 2 in. (50 mm) provided that:

(d1) They are checked by drilling a stopper hole within the range of 0.09375 in. to 0.1875 in. (2,5 mm to 4,5 mm) and,

(d2) They are periodically checked at intervals not exceeding 90 hours of engine flight time.

(2) The following damage and extended limits are acceptable for a further 25 hours maximum flight time.

(a) Any cracks that extend from a scallop to another scallop or to the panel edge.

(b) Any cracks that extend from panel edge to

panel edge.

B. Unacceptable Damage.

(1) Reject a heat shield panel with the following unacceptable damage:

(a) Damage which fails to meet the acceptable limits detailed in paragraph 4.A.

(b) Cracks which combine together and result in loss of material with an area greater than 4 sq. in. (2 580 sq. mm).

(c) Any damage which results in fouling of engine dressings.

R C. Repair.

R (1) For approved repair and materials refer to Olympus
R Overhaul Manual, Vol.1, 71-32-02 Repair No.1.

5. Damage Monitoring Checks

A. If damage within the acceptable limits stated in paragraph 4.A. is present, the affected area must be inspected at the intervals specified. This inspection must also cover the possibility of secondary damage to other areas as follows:

(1) When monitoring cracked/torn heat shields, carry out a visual inspection for signs of secondary damage to the engine dressing, particularly the LP turbine oil feed and return tubes.

UNDERWING FIREWALL - REMOVAL/INSTALLATION

WARNING: OPERATORS ARE ADVISED TO WEAR PROTECTIVE CLOTHING/EQUIPMENT WHEN HANDLING HEAT SHIELD PANELS. THIS SHOULD BE OVERALLS, GLOVES AND A SUITABLE RESPIRATORY PROTECTOR SUCH AS 3M'S DISPOSABLE FACEPIECE RESPIRATOR TYPE 8810 OR A SUITABLE APPROVED EQUIVALENT.

1. General

This topic describes, in general terms, the Removal/Installation of the firewall panels in the engine bays. When removing these panels it is essential to note the position of attaching parts and the order in which they are used. So many fittings and brackets are secured to the panels that it is impracticable to detail all the securing parts on every panel in each engine bay. In general, when a complete firewall is to be removed from an engine bay, the engine and all engine bay roof components, pipes and fittings must first be removed.

2. Firewall Panels

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner range: 0-60 lbf in (0-0.67 mdaN)	-
Locking wire, nimonic 0.028 in (0.71 mm) dia.	-

B. Prepare

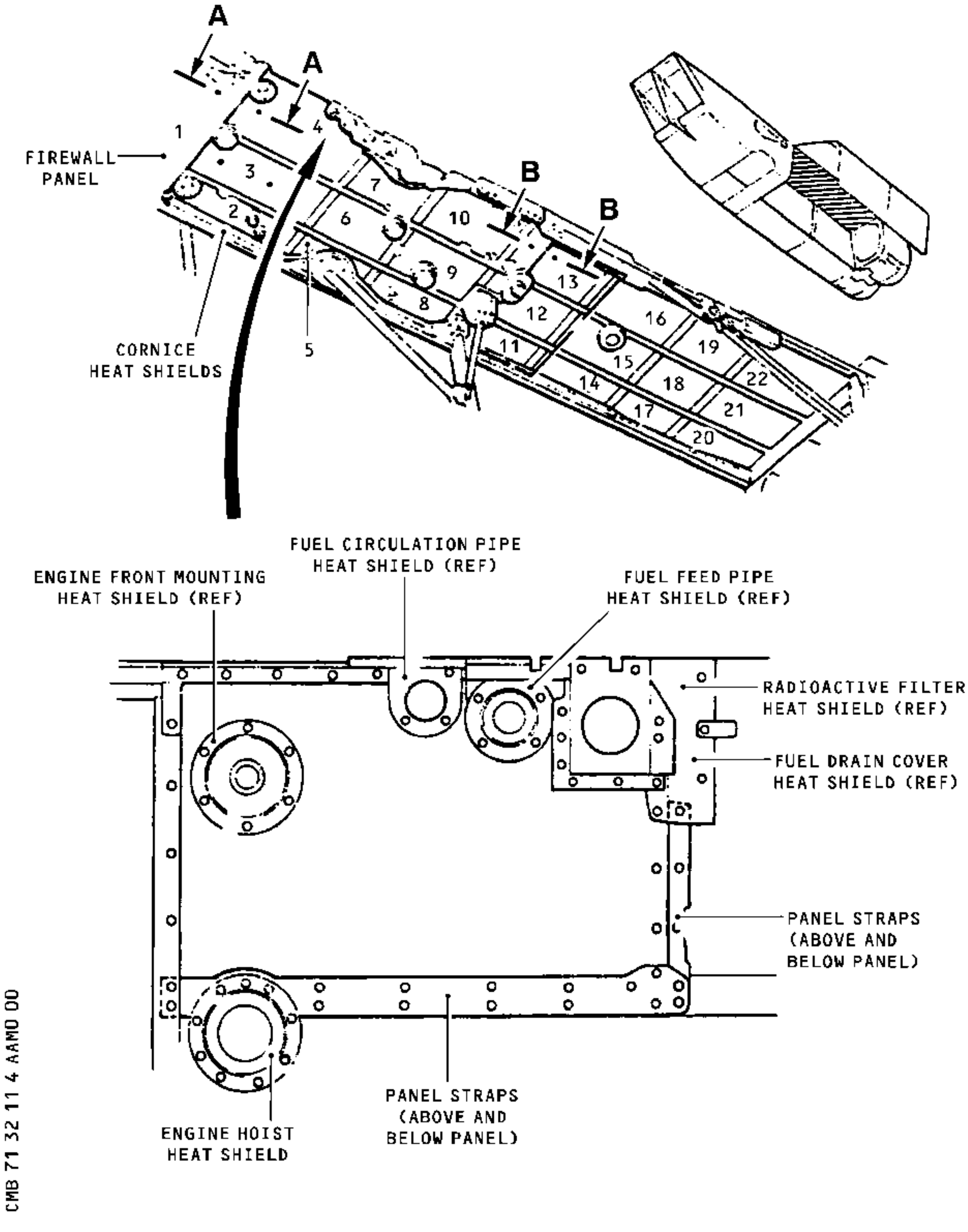
(1) Ensure that the engine/s has/have been removed and comply with the safety precautions associated with engine removal (Ref. 71-00-12).

NOTE: Under this heading the main fuel feed pipe, fuel recirculation pipe and electrical connector box heat shields are removed. (Ref. 71-00-12, Engine Removal/Installation).

(2) Remove the primary and secondary heat exchangers and the associated inlet and outlet ducting (Ref. 21-12-11 and 14, Removal/Installation).

NOTE: The radioactive filter heat shield is removed as part of this topic.

(3) Remove any system piping secured to the engine bay roof.



Underwing Firewall - Installation
Figure 401 (Sheet 1 of 2)

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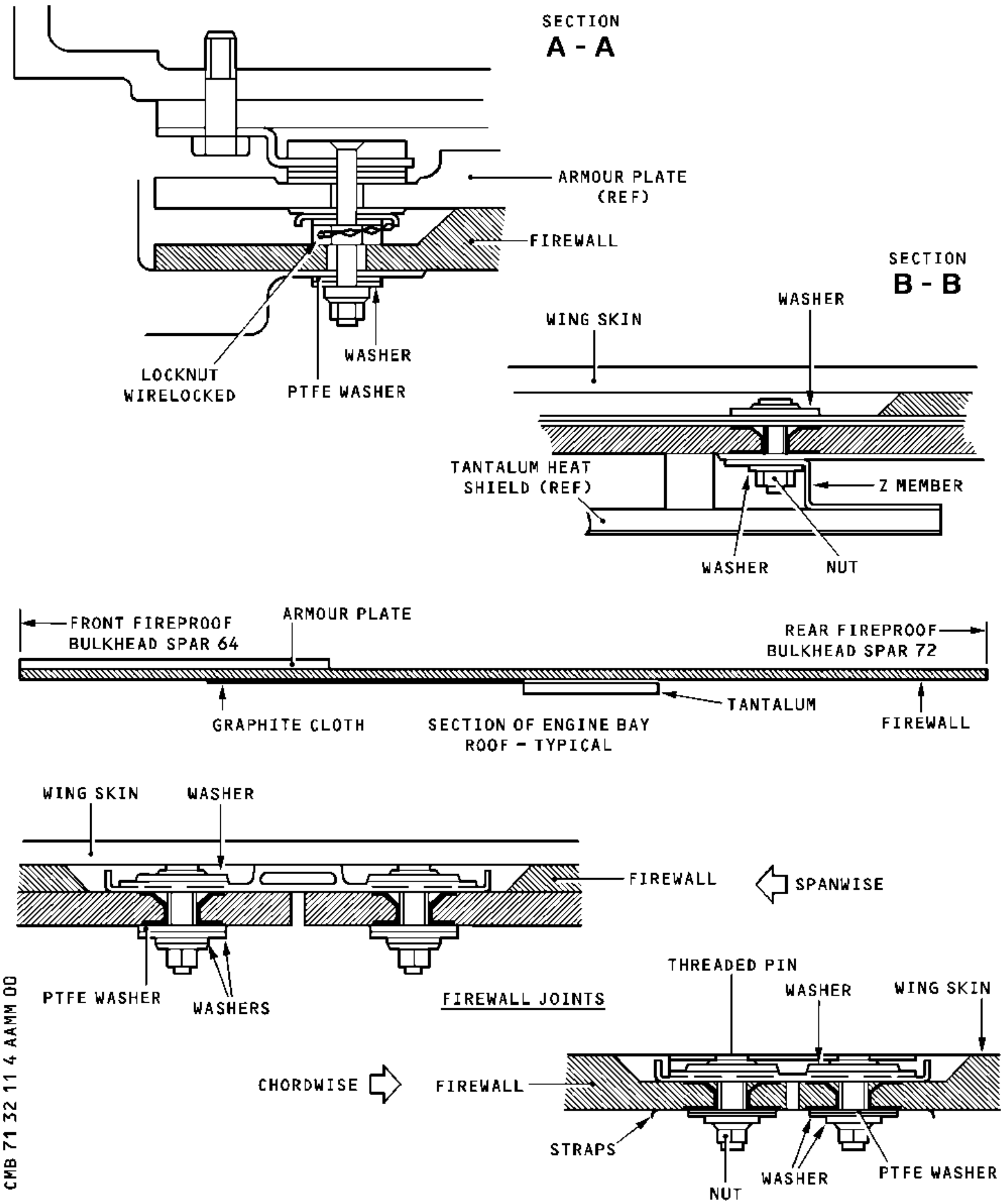


Underwing Firewall - Installation
Figure 401 (Sheet 2 of 2)

C. Remove Firewall (Ref. Fig.401)

CAUTION: IT IS ESSENTIAL TO NOTE THE POSITION OF ATTACHING PARTS AND THE ORDER IN WHICH THEY ARE USED.

NOTE: Most firewall panels are secured by threaded pins and self-locking nuts but there are places where other methods, particularly bolts, are used. These are usually wirelocked in pairs. The points must be listed on disassembly and the same locking method used on assembly.

(1) Remove all brackets and fittings attached to the engine bay roof or, where only a section of the firewall is to be removed, those sited in the working area.

(2) Disconnect the cable ties securing electrical cables to the cable supports. Do not disturb the electrical connections. Remove the cable supports.

NOTE: It should be possible to flex electrical cables sufficiently to permit the removal of firewall panels without disconnecting the cables.

(3) Remove the cornice and secondary heat shields at the top of the centrewall (Ref. 71-32-13, Removal/Installation).

(4) Remove the cornice and secondary heat shields on the engine bay door hinge line.

(5) Remove the tantalum heat shields in the engine bay roof rear of the main engine mounts (Ref. 71-32-12, Removal/Installation).

(6) Remove the secondary heat shields on all apertures to the firewall.

(7) Starting at No.1 firewall panel support each panel in turn and remove the nuts and washers securing the straps and panel periphery. Remove the panel and the top and bottom straps.

NOTE: At the forward end of each engine bay the pins which secure the firewall panels also secure the armour plate and the screw pins will remain in position. In all other areas the screw pins and washers may be detached from the roof brackets and removed.

D. Prepare to Install

(1) Comply with the electrical precautions associated with engine removal (Ref. 24-00-00).

(2) Ensure that the armour plate is installed and locked (Ref. 71-00-14, Removal/Installation).

(3) Ensure that the area is clean.

E. Install Firewall Panels (Ref. Fig.401)

(1) Install threaded pins and washers in the roof brackets and, starting at No.1 firewall panel, engage each panel and top and bottom straps with the pins and secure with PTFE washers, washers and nuts.

NOTE: In the area where armour is fitted the panels and straps are secured to pins which protrude through the armour.

(2) Ensure that a nominal gap of 0.060 in (1.5 mm) exists between underwing heat shield panels.

NOTE: This is best achieved by ensuring that the panels are located centrally on the pins.

(3) Torque-tighten panel nuts to 20 lbf in (0.226 mdaN) then slacken back one complete turn.

(4) Between spars 68 and 69, rear of the main engine mounts, fit 'Z' members to the firewall panel pins to support the top tantalum heat shield (Detail A). Torque-tighten the panel pins (Ref. 20-21-11).

(5) Install the secondary heat shields on all cut-outs and apertures in the underwing firewalls (Ref. 71-32-13, Removal/Installation).

(6) Install the tantalum heat shields rear of the engine mounts (Ref. 71-32-12, Removal/Installation).

(7) Install the cornice and secondary heat shields on the engine bay door hinge line.

(8) Install the cornice and secondary heat shields at the top of the engine bay centre wall.

(9) Install the cable support adjoining the main fuel feed pipe support struts. Secure the support with a distance piece and screw at the forward end and a distance piece and nut at the rear. Torque-tighten the nut (Ref. 20-21-11) and the screw to between 12 and 15 lbf in (0.13 and 0.17 mdaN). Secure the electrical cables to the support with cable ties in accordance with the wiring diagram manual.

(10) Install brackets and fittings previously removed in the engine bay (Ref. 71-41-00, Removal/Installation).

C. Conclusion

(1) Install fire protection pipes previously removed (Ref. 26-21-11, Removal/Installation).

(2) Install the primary and secondary heat exchangers and the associated inlet and outlet ducting (Ref. 21-12-11 and 14, Removal/Installation).

(3) The engine may be replaced when other servicing tasks permit.

UNDERWING FIREWALL - INSPECTION/CHECK

WARNING: DAMAGE TO A FIREWALL PANEL IN EXCESS OF THE PERMISSIBLE DAMAGE (REF. FIG. 601) IS A HAZARD TO THE SAFETY OF THE AIRCRAFT.

R OPERATORS ARE ADVISED TO WEAR PROTECTIVE CLOTHING/
R EQUIPMENT WHEN HANDLING HEAT SHIELD PANELS. THIS SHOULD
R BE OVERALLS, GLOVES AND A SUITABLE RESPIRATORY PROTECTOR
R SUCH AS 3M'S DISPOSABLE FACEPIECE RESPIRATOR TYPE 8810
R OR A SUITABLE APPROVED EQUIVALENT.

1. General

Some firewall panels may be accessible for inspection with the engine installed, and the use of remote inspection equipment would increase this number, but it is necessary to remove the engine, the air conditioning components in the engine bay roof and the tantalum heat shields for access to all the firewall panels. The Xylan 1010 (PTFE) and glasscloth check cannot be carried out with the panels on the aircraft.

2. Firewall Panels

A. Equipment and Materials

DESCRIPTION	PART NO.
Rigid intrascope (approximately 1.5 metres in length)	-

B. Prepare

(1) Remove the engine (Ref. 71-00-12, Removal/Installation).

(2) Remove the primary and secondary heat exchangers and ducting (Ref. 21-12-11 to 14, Removal/Installation).

(3) Remove, if necessary, the tantalum heat shields. (Ref. 71-32-12, Removal/Installation).

C. Inspect Firewall panels (Ref. Fig. 601)

(1) Inspect firewall panel for cleanliness.

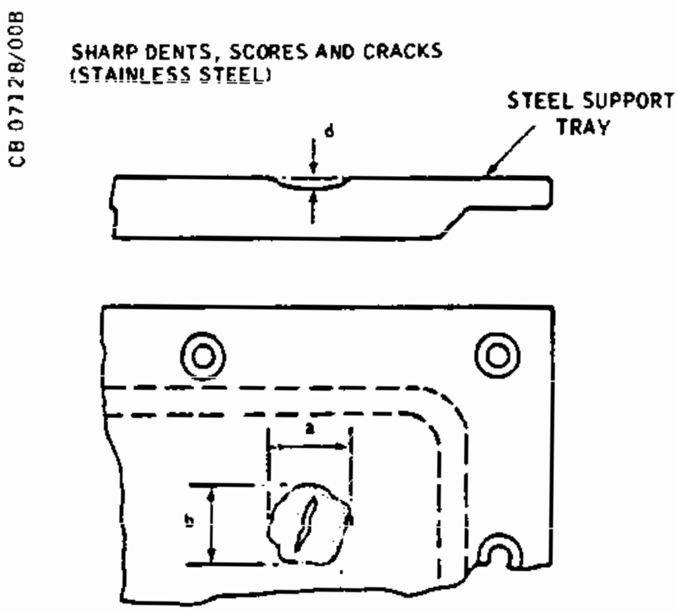
(2) Inspect the panels for security:

(a) Check the security of the panel nuts.

(b) Check the wirelocking of boltheads.

DESCRIPTION AND TYPE OF DAMAGE	LIMITATIONS

SHARP DENTS, SCORES AND CRACKS (STAINLESS STEEL)



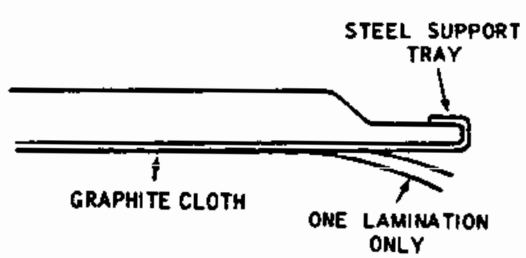
Smooth dents:
d max = 0.080 in (2 mm)
a x b = max area =
1 x 0.25 in (25 x 6 mm)
area

Sharp dents)
Scores)
Cracks)
Holes)
are not allowed

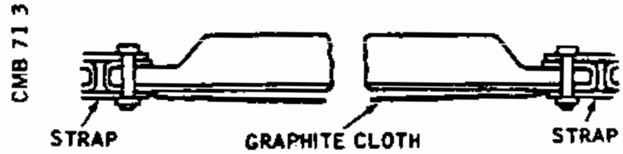
CRACKS (FIBREGLASS AND PTFE)

Cracks in Xylan 1010 or Pre-pregnated glasscloth are not allowed

CUTS, TEARS AND ABRASIONS (GRAPHITE CLOTH)



Cuts tears and abrasions permissible through one lamination only, but loss of material is not allowed.



Separation of graphite cloth from the support tray is permitted over the whole area of a panel bounded by the straps.

R

Firewall Panels, Permissible Damage
Figure 601

(c) Check the security of panel straps and secondary heat shields associated with the panels.

(3) Inspect for damage the steel support trays which form the base of the panels:

(a) Check for dents, scores, cracks or abrasions.

(b) Check the edges and corners for distortion or crushed areas.

(c) Check the ferrules for damage or security.

(d) Check for chafing between the trays and secondary heat shields or brackets and fixtures.

(e) Check the breather assemblies for cleanliness, damage and security.

(4) On panels which have graphite cloth covering the support tray, check the cloth for cuts tears and abrasions.

NOTE: It is permissible for the graphite cloth to become separated from the support tray (Ref. Fig. 601).

(5) Inspect for damage the Xylan 1010 coating and the glasscloth:

NOTE: This inspection can only be carried out if the panel(s) have been removed from the aircraft.

(a) Check the PTFE surface for cracks, scores or abrasions.

(b) Check for distortion, malalignment, crushing or tearing of the panel, and for loss or migration of the Min K insulating material.

(c) Check for signs of chafing between the panel surface and the wing skin.

(d) Check for blistering or swelling of the panel surface.

D. Conclusion

(1) Carry out any necessary repairs (Ref. 71-31-11, Approved Repairs).

(2) Replace the panel(s) on the aircraft (Ref. 71-32-11, Removal/Installation.

(3) Replace, if necessary, the tantalum heat shields (Ref. 71-32-12, Removal/Installation).

(4) Replace the primary and secondary heat exchangers and ducting (Ref. 21-12-11 to 14, Removal/ Installation).

(5) The engine may be refitted when other servicing tasks permit (Ref. 71-00-12, Removal/Installation).

UNDERWING FIREWALL - APPROVED REPAIRS

WARNING: OPERATORS ARE ADVISED TO WEAR PROTECTIVE CLOTHING/EQUIPMENT WHEN HANDLING HEAT SHIELD PANELS. THIS SHOULD BE OVERALLS, GLOVES AND A SUITABLE RESPIRATORY PROTECTOR SUCH AS 3M'S DISPOSABLE FACEPIECE RESPIRATOR TYPE 8810 OR A SUITABLE APPROVED EQUIVALENT.

1. General

Of the approved repairs detailed in this topic, repair No.6 may be done in situ. All other repairs necessitate the removal of the damaged firewall panel, which in turn needs to be phased in with the removal of the engine and air conditioning components. A small number of panels may be accessible with the engine installed.

Repairs Nos.1 and 2 cover the renovation of the Xylan 1010 PTFE coating and the replacement of damaged Min-K insulation, these repairs are also needed to complete later and more extensive repairs to the steel support trays.

Repair plugs may be compressed to conform to the profile of the existing panel top surface using a locally manufactured former.

2. Xylan 1010 PTFE Coating (Ref. Fig.801)

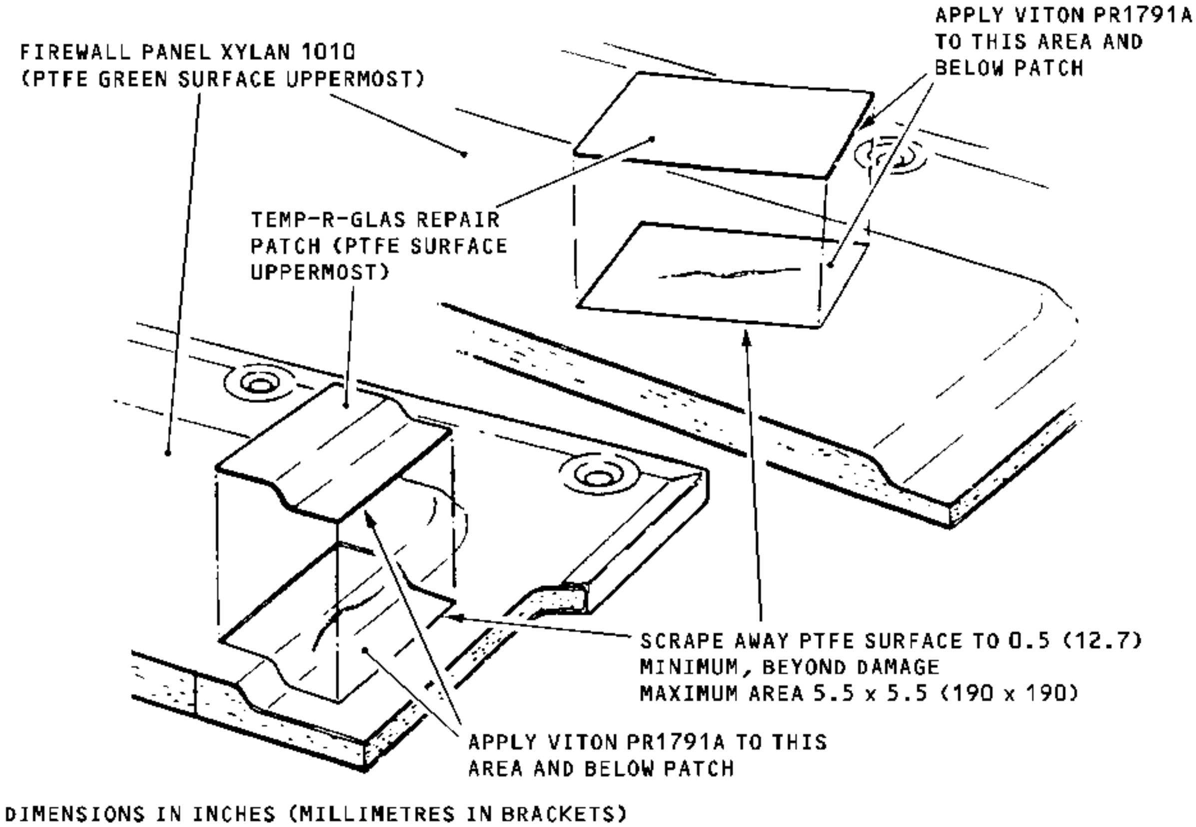
A. Equipment and Materials

DESCRIPTION	PART NO.
PTFE coated glasscloth tape Temp-R-Glas/5 TSC	-
Viton PR1791A (Ref. 20-30-00, No.392)	-
Spatula	-
Kimwipe tissue	-
Brush	-

B. Prepare

(1) Remove the engine (Ref. 71-00-12, Removal/Installation).

(2) Remove the primary and secondary heat exchangers and ducting if necessary (Ref. 21-12-11 to 21-12-14, Removal/Installation).



Repair to Xylan 1010 Coating
Figure 801

(3) If necessary, remove the tantalum heat shield (Ref. 71-32-12).

(4) Remove the relevant firewall panel(s) (Ref. 71-32-11, Removal/Installation).

C. Repair

B NOTE: Bond the repair patch with Viton PR1791A (Ref. 20-22-12).

(1) Support the panel on a suitable bench with the green surface Xylan 1010 (PTFE) uppermost and carefully scrape away the PTFE coating to 0.5 in (12.7 mm) beyond the damaged area.

(2) Cut a patch of Temp-R-Glas/5TSC to match this area.

(3) Apply a thin coat of Viton to the underside of the Temp-R-Glas patch (on the opposite side to the PTFE surface), and to the cleaned-out area of the panel.

NOTE: The PTFE surface side of the tape has the smoother surface.

(4) Engage the patch with the cleaned-out area of the panel and smooth out air bubbles from the centre outwards.

(5) Wipe off the excess Viton with a Kimwipe tissue leaving a small fillet around the periphery of the patch.

D. Conclusion

(1) Refit the panel (Ref. 71-32-11, Removal/Installation).

NOTE: The panel may be fitted to the aircraft as soon as it is surface dry.

(2) Replace as necessary the tantalum heat shields (Ref. 71-32-12, Removal/Installation).

(3) Replace the air conditioning components (Ref. 21-12-11 to 21-12-14, Removal/Installation).

(4) The engine may be refitted when other servicing tasks permit (Ref. 71-00-12, Removal/Installation).

3. Min-K Insulation

A. Equipment and Materials

	DESCRIPTION	PART NO.
	Knife	-
	PTFE coated glasscloth tape Temp-R-Glas/5TSC	-
B B	Viton PR1791A (Ref. 20-30-00, No.392)	-
	Trepanning tool	-
	Facemask and particle filter	-

DESCRIPTION	PART NO.
Repair plug cut from scrap underwing firewall panel	-

B. Prepare

(1) Comply with the instructions in para. 2.B.

C. Repair (Ref. Fig.802)

B NOTE: Bond the repair with Viton PR1791A (Ref. 20-22-12).

(1) Support the panel on a suitable bench with the green Xylan 1010 (PTFE) surface uppermost.

(2) Remove the damaged material:

NOTE: It is possible to damage the support tray during this operation unless precautions are taken to prevent the trepanning tool from cutting into the support tray.

(a) Using a trepanning tool cut into the panel from the PTFE side to within 0.010 in (0.25 mm) of the inside face of the stainless steel support tray.

(b) Cut the thread attaching the Min-K to the glasscloth.

(c) Remove the tool and the damaged plug.

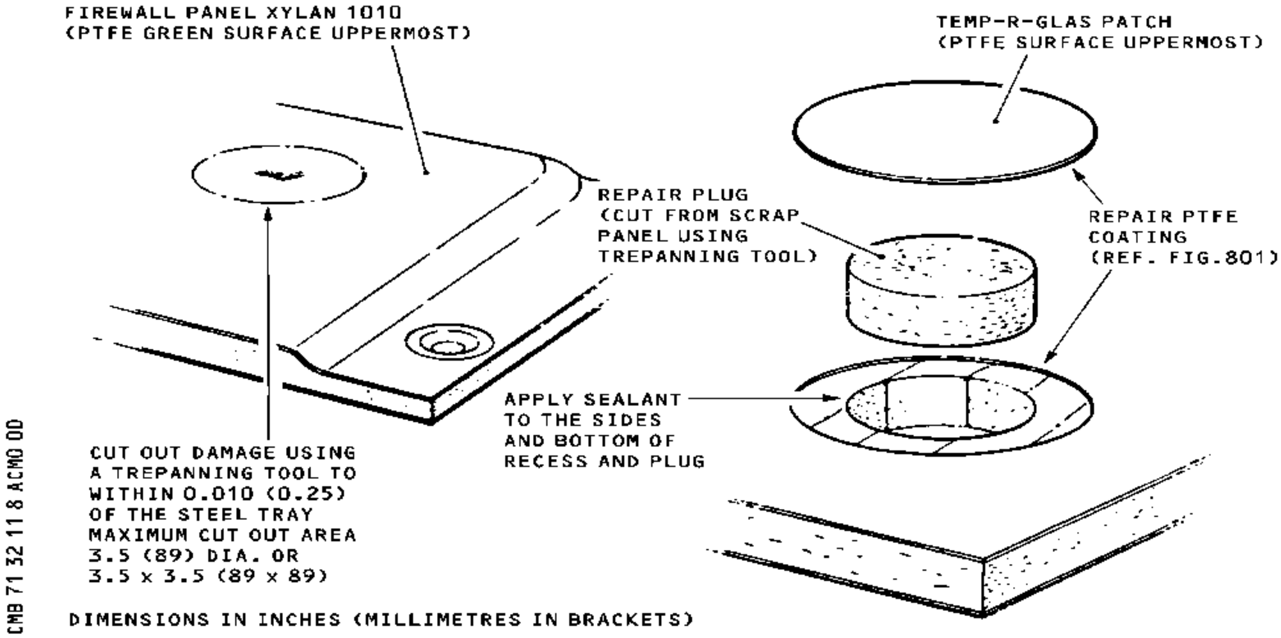
(3) Remove the PTFE coating to 0.5 in (12.7 mm) beyond the edge of the cut-out (Ref. para. 2.).

(4) Using the trepanning method previously described, or a sharp knife, cut a repair plug from a scrap panel.

(5) Apply Viton to the bottom and sides of the recess (Ref. 20-22-12) and to the plug and insert while still wet. Wipe away the excess sealant with a Kimwipe tissue.

NOTE: Apply Viton to the sides of the recess and repair plug in patches. Do not completely seal to allow venting.

(6) Repair the PTFE coating as in para. 2.



Repair to Min-K Insulation
Figure 802

D. Conclusion

(1) Comply with the Conclusion operation in para. 2.D.

4. Hole in the Support Tray

A. Equipment and Materials

DESCRIPTION	PART NO.
Portable grinding machine with cutting wheel (thin)	-
Repair plug cut from scrap underwing firewall panel	-
Face mask and particle filter	-
PTFE coated glasscloth tape Temp-R-Glas/5TSC	-
B Viton PR1791A B (Ref. 20-30-00, No.392)	-

DESCRIPTION	PART NO.
Portable welding kit (Incorporall) 2KVA, for use on 110, 230 or 400V, 40/60 Hz complete with instruction manual (Ref. 20-26-31)	-
Stainless steel sheet, 0.005 in (0.13 mm) thick	S521/CM230

B. Prepare

(1) Comply with the instructions in para. 2. Prepare.

C. Repair (Ref. Fig.803)

B NOTE: Bond the repair with Viton PR1791A (Ref. 20-22-12). Spot weld (Ref. 20-26-31).

(1) Support the panel on a suitable bench with the green Xylan 1010 (PTFE) surface uppermost.

(2) Remove the damaged material:

(a) Cut around the damaged area, or trepan, cut the stitches and remove the damaged plug. Do not exceed the maximum area detailed in the illustration.

(3) Dress out the damage to the support tray.

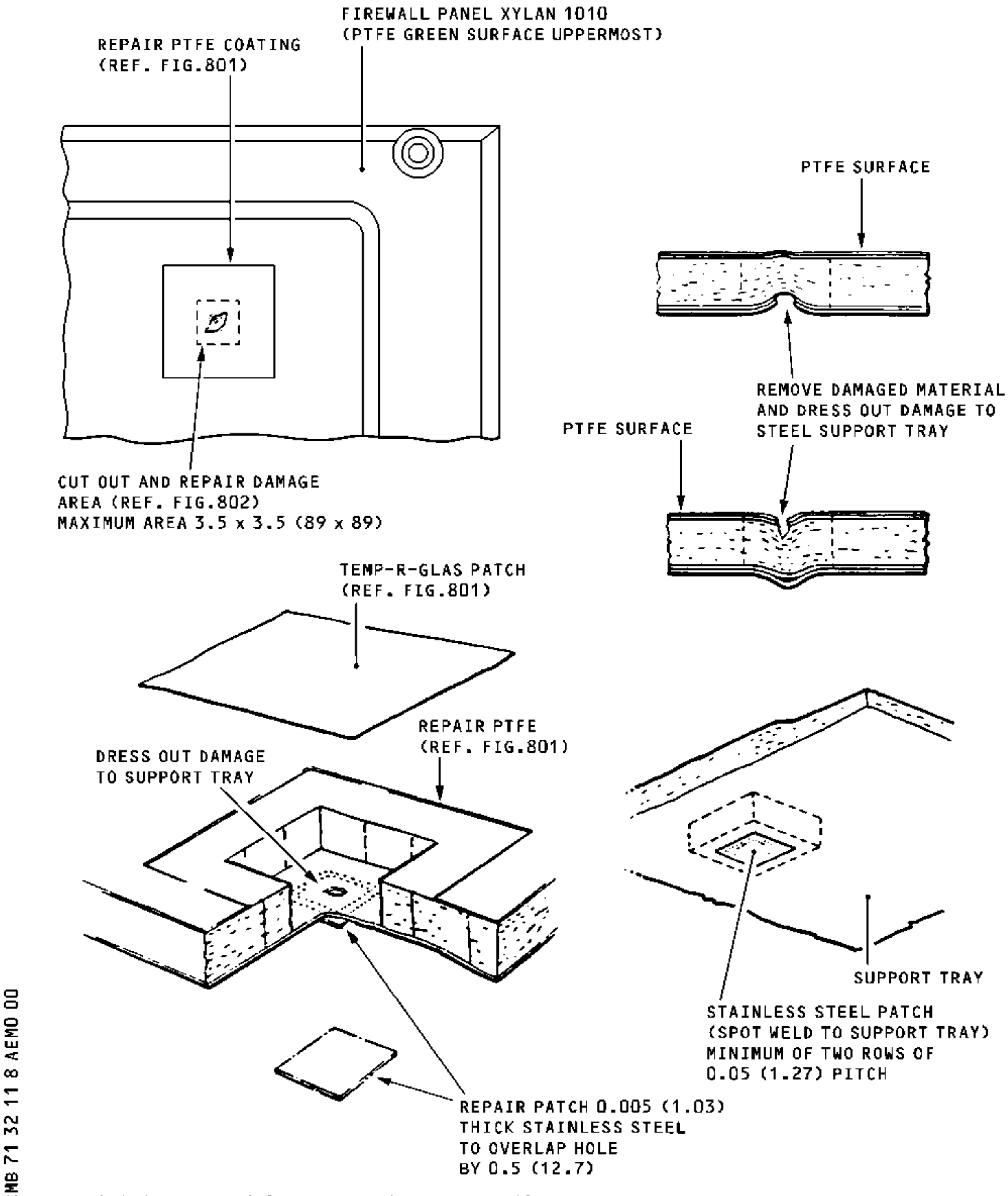
(4) Cut a repair patch from 0.005 in (0.13 mm) thick stainless steel approximately 0.5 in (12.7 mm) beyond the hole in the support tray.

(5) Weld the patch centrally over the damaged area outside the tray. Secure the patch with a minimum of two rows of spot welds.

NOTE: It is most important that the metal surfaces of the support tray and patch are in firm contact during this operation.

(6) On panels that do not have graphite cloth, seal the edges of the metal patch with a fillet of Viton (Ref. 20-22-12).

(7) Using the trepanning method previously described, cut a repair plug from a scrap panel.



DIMENSIONS IN INCHES (MILLIMETRES IN BRACKETS)

Repair to a Hole in the Support Tray
Figure 803

(8) Bond the repair plug into the panel:

(a) Apply Viton (Ref. 20-22-12) to the sides and bottom of the recess and plug and insert while still wet, wipe away the excess sealant with a Kimwipe tissue.

NOTE: Apply Viton to the sides of the recess and repair plug in patches, do not seal completely.

(9) Repair the PTFE coating and conclude as in para. 2.D.

5. Punctured Stainless Steel Support Tray

A. Equipment and Materials

DESCRIPTION	PART NO.
Stainless steel sheet, plain 0.005 in (0.13 mm) thick	S521/CM230
Stainless steel sheet, cross corrugated 0.010 in (0.254 mm) thick	S521/CM230
Stainless steel sheet, cross corrugated 0.006 in (0.1524 mm) thick	S521/CM230
Portable grinding machine with cutting wheel (thin)	-
Portable welding kit (Incorporall) 2KVA, for use on 110, 230 or 400V, 40/60 Hz complete with instruction manual (Ref. 20-26-31)	-
Face mask and particle filter	-
Graphite cloth (BAC M341)	-
B B Viton PR1791A (Ref. 20-30-00, No.392)	-
Sharp knife	-
Mains or portable electrical power source for welding kit	-

B. Prepare

(1) Comply with the instructions in para. 2.B., but in this instance it is not necessary to remove the firewall panel since this repair can be accomplished in situ.

(2) Clean the panel using the approved solution (Ref. BAC M302).

C. Repair (Ref. Fig.804)

B NOTE: Bond the repair with Viton PR1791A (Ref. 20-22-12).

Spot weld (Ref. 20-26-31).

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(1) If the panel has a graphite cloth covering remove it as detailed in para. 6.

(2) Seal the puncture with Viton (Ref. 20-22-12) and completely fill the indentation to surface level. Confine the sealant to the cavity. Do not allow to come in contact with the area that is to be welded.

(3) Cut a repair patch from plain stainless steel 0.005 in (0.13 mm) thick to repair damage on a plain stainless steel tray. Cut from cross corrugated stainless steel to repair damage on cross corrugated panels, 0.010 in (0.254 mm) thick for repairs on the lower face and 0.006 in (0.1524 mm) thick for repairs on the upper face. The repair patch must overlap the damaged area by 0.5 in (12.7 mm).

NOTE: The maximum damage is not to exceed 4.0 in (101.6 mm) diameter or be within a circle of this size.

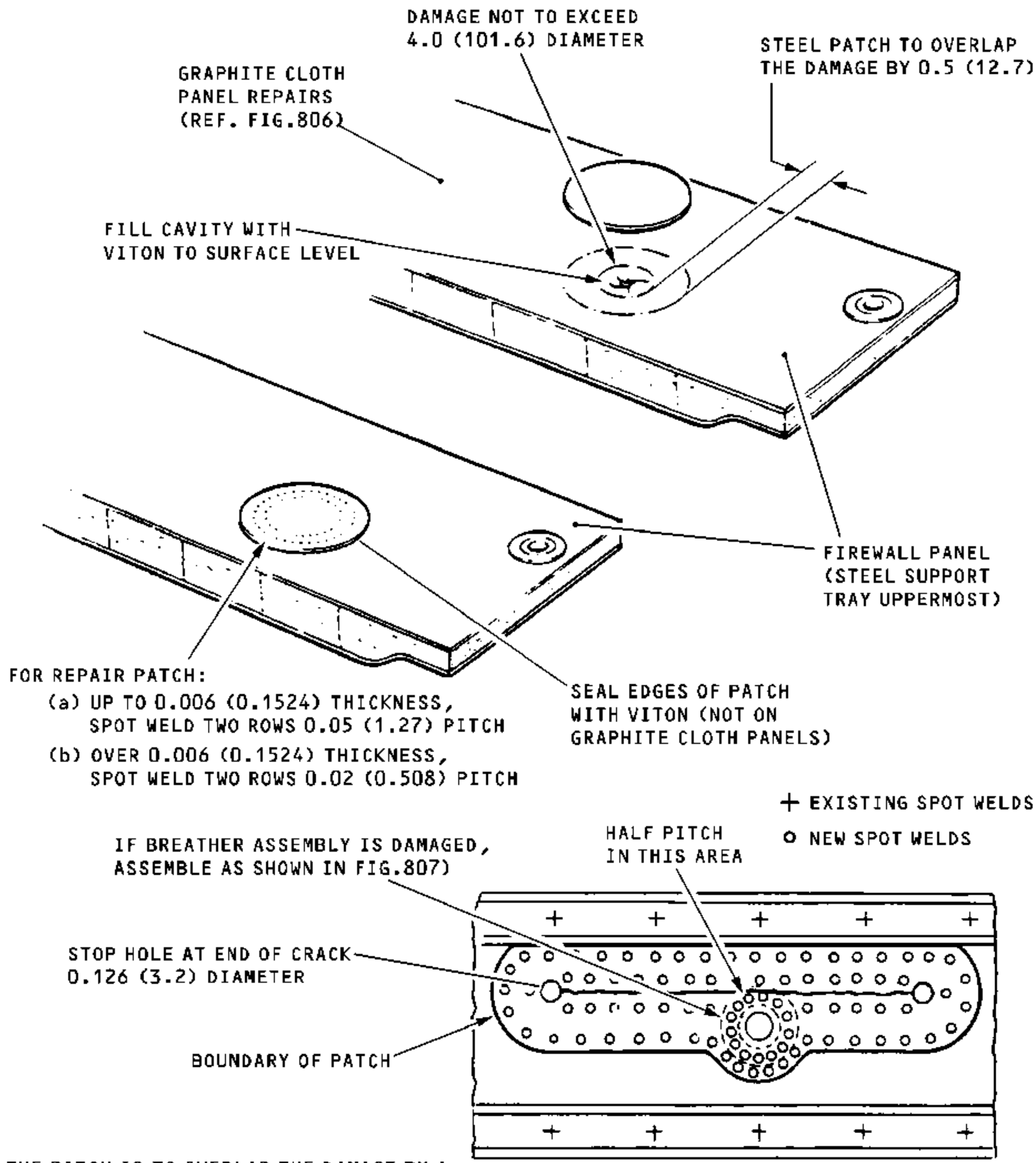
(4) Weld the patch centrally over the damaged area securing it with a minimum of two rows of spot welds at a pitch of 0.05 in (0.127 mm), (Ref. 20-26-31).

NOTE: The next operation is not applicable if the repair is to a panel covered with graphite cloth.

(5) Seal the edges of the repair patch with a fillet of Viton
B PR1791A (Ref. 20-22-12).

(6) If the panel has a graphite cloth covering, repair this in accordance with para. 6.

(7) If necessary, re-coat the upper face of cross-corrugated stainless steel panel with fibreglass and Viton.



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THE PATCH IS TO OVERLAP THE DAMAGE BY A MINIMUM OF 0.5 (12.7) AND IS TO BE SPOT WELDED WITH TWO ROWS OF WELDS AS SHOWN

NOTE: WHEN USING SEALANT IN THE PROXIMITY OF VENTS ENSURE THAT THE SEALANT DOES NOT BLOCK AIR PASSAGE.

DIMENSIONS IN INCHES (MILLIMETRES IN BRACKETS)

Repair to a Punctured Support Tray
Figure 804

D. Conclusion

(1) Remove all tools and equipment used for the repair from the engine bay.

(2) If necessary, replace the tantalum heat shield (Ref. 71-32-12).

(3) Replace the air conditioning components, if necessary, (Ref. 21-12-11 to 21-12-14, Removal/Installation).

(4) The engine may be replaced when other servicing tasks permit (Ref. 71-00-12, Removal/Installation).

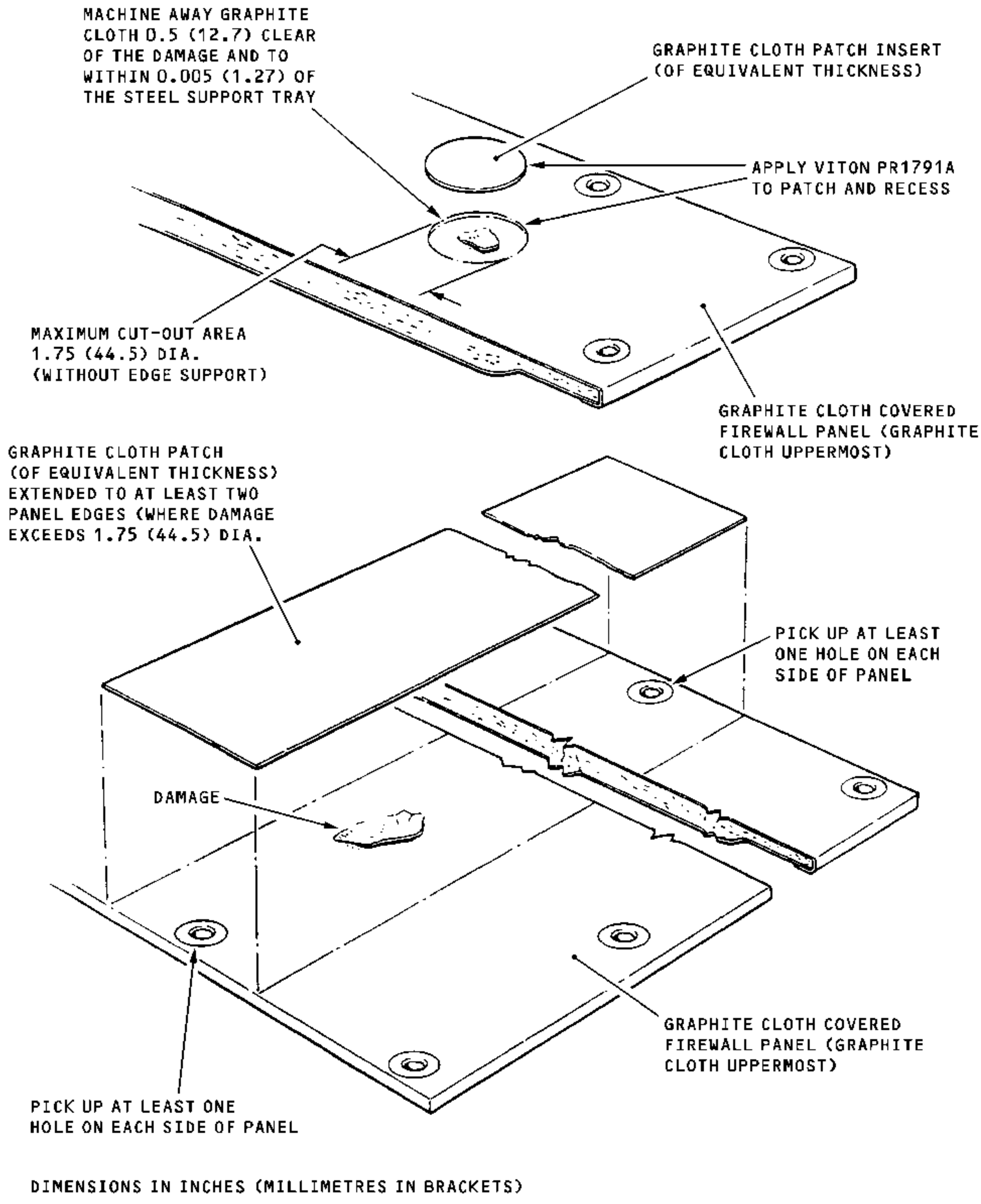
6. Graphite Cloth

A. Equipment and Materials

DESCRIPTION	PART NO.
Graphite Cloth (BAC M341)	-
B Viton PR1791A B (Ref. 20-30-00, No.392)	-
Kimwipe tissue	-
Emery wheel or milling end cutter (for machining graphite cloth)	-
Portable drill	-
Face mask and particle filter	-

B. Prepare

(1) Comply with the instructions in para. 2.B., but in this instance it is not necessary to remove the firewall panel, since this repair can be accomplished in situ.



Repair to Graphite Cloth
Figure 805

C. Repair (Ref. Fig.805)

WARNING: USE A FACEMASK FITTED WITH A PARTICLE FILTER.

B NOTE: Seal with Viton PR1791A (Ref. 20-22-12).

(1) Using a portable drill and an emery wheel or milling end-cutter machine away the graphite cloth 0.5 in (12.7 mm) clear of the damaged area, and to within 0.005 in (0.127 mm) of the stainless steel tray. For the maximum permitted area (Ref. Fig.805). If this is exceeded see NOTE (Ref. Operation (4)).

(2) Carefully scrape away the remaining graphite cloth and the silicone adhesive (RTV 504).

(3) Remove all trace of the RTV 504 by lightly abrading the stainless steel.

CAUTION: DO NOT USE FORCE SINCE IT IS POSSIBLE TO PENETRATE THE SUPPORT TRAY.

(4) Cut a piece of graphite cloth to fit the area removed, and of equivalent thickness.

NOTE: If the maximum cut-out area exceeds 1.75 in (44.5 mm) diameter then the patch must be extended to at least two adjacent edges of the panel and pick-up at least one hole on either side. Where this procedure is adopted the Viton is to be applied to the surface of the existing graphite cloth. Do not cut away more cloth.

(5) Coat the repair recess and the graphite cloth with Viton PR1791A and apply the patch smoothing out air bubbles from the middle outwards (Ref. 20-22-12).

(6) Remove the excess Viton from around the edges of the patch with a Kimwipe tissue, leaving a fillet at the edge of the patch.

D. Conclusion

(1) Comply with the instructions in para. 5.D.

7. Corner and Edge (plain stainless steel tray only)

A. Equipment and Materials

DESCRIPTION	PART NO.
PTFE Coated glasscloth tape Temp-R-Glas/5 TSC	-
B B Viton PR1791A (Ref. 20-30-00, No.392)	-
Spatula	-
Kimwipe tissue	-
Brush	-
Graphite cloth (BAC M341)	-
Stainless steel sheet, 0.005 in (0.127 mm) thick	S521/CM230
Portable welding kit (Incorporall) 2KVA, for use on 110, 230 and 400V, 40/60 Hz complete with instruction manual (Ref. 20-26-31)	-
Mains or portable electrical power source for welding kit	-
Repair plug cut from scrap firewall panel	-
Glasscloth (BAC M351)	-
Grinding machine with cutting wheel (thin)	-
Facemask and particle filter	-
Min-K insulation (BAC M350)	-

B. Prepare

(1) Comply with the instructions in para. 2.B.

(2) Support the panel on a suitable bench, support tray uppermost and remove the damaged material.

NOTE: In the illustration the panel is shown PTFE side uppermost to permit more detail on the repair patches.

(a) If the panel has graphite cloth, machine the cloth away to 0.5 in (12.7 mm) beyond the cut-out as described in para. 6.

(b) Cut away the damaged portion of the edge or corner using the cutting wheel.

NOTE: It may be possible to cut out the damage to the tray and, leaving the insulation envelope intact, to pack in additional Min-K through the split edges to restore the panel to its previous shape.

A damaged ferrule can be repaired by insertion (repair B) provided a template is manufactured to locate the hole. Otherwise the panel must be replaced.

(3) Turn the panel over and remove the Xylan 1010 PTFE coating to 0.5 in (12.7 mm) beyond the cut-out as described in para. 2.

NOTE: An alternative repair is described in para. E.

C. Repair A (Ref. Fig.806)

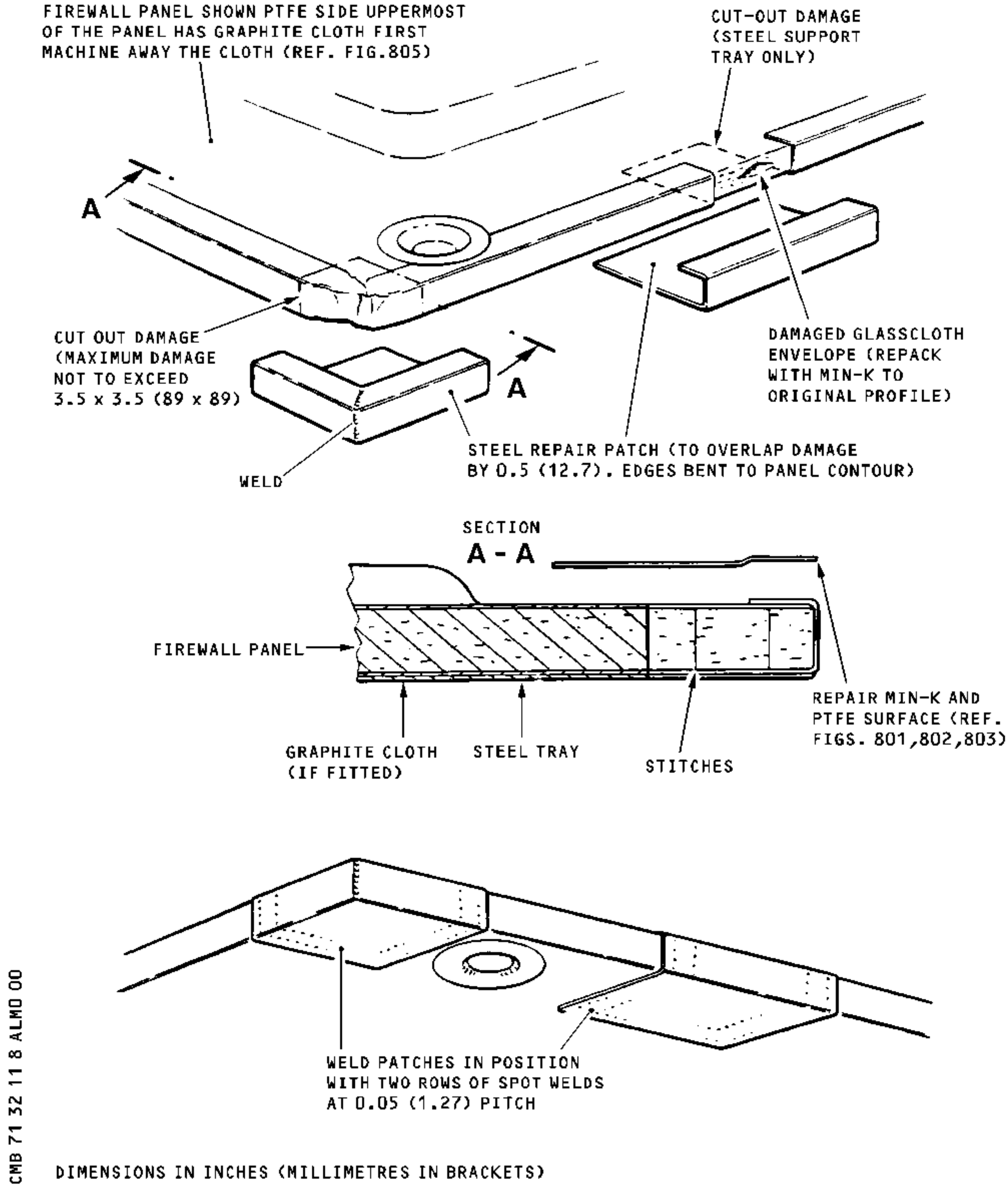
B NOTE: Bond with Viton PR1791A (Ref. 20-22-12).

Spot Weld (Ref. 20-26-31).

(1) Cut a repair patch from stainless steel sheet (S521/CM230) 0.005 in (0.127 mm) thick to overlap the cut out by 0.5 in (12.7 mm) in each direction.

(2) Bend the free edge or edges of the repair patch to fit neatly round the existing panel edge channel. The original panel contour must be maintained. Weld the corner and channel edges as illustrated.

NOTE: Apply a little Viton to the centre of the patch and to the patch flanges, do not contaminate the area to be welded with sealant.



DIMENSIONS IN INCHES (MILLIMETRES IN BRACKETS)

Repair to Corner or Edge
Figure 806

(3) Repack the repaired area of the panel with Min-K, pressing on the Min-K as hard as is practicable.

(4) Engage the repair patch with the panel and weld it in position using the portable welding kit. Use a minimum of two rows of spot welds.

(5) Repair the graphite cloth, if necessary, as detailed in para. 6.

(6) On panels which do not have graphite cloth, seal the edges of the steel patch with a Viton fillet (Ref. 20-22-12).

(7) Turn the panel over and repair the PTFE covering as detailed in para. 2.

D. Conclusion

(1) Refit the panel to the aircraft (Ref. 71-32-11, Removal/Installation).

NOTE: The panel may be fitted to the aircraft as soon as it is surface dry.

(2) Conclude as in para. 2.D.

E. Repair B (Ref. Fig.806)

NOTE: This is an alternative repair to para. C.

B Bond with Viton PR1791A (Ref. 20-22-12).

Spot weld (Ref. 20-26-31).

(1) Cut a repair insert from a spare panel using the grinding wheel (metal only) use a sharp knife for the non-metallic plug.

(2) With the support tray uppermost apply a coat of Viton (Ref. 20-22-12) to the cut edges on the panel and insert and engage the plug and insert.

NOTE: Apply the Viton in patches, do not seal completely to allow ventilation.

(3) Cut a stainless steel cover patch to overlap the area by 0.5 in (12.7 mm). Bend the free edge or edges of the repair patch to fit neatly around the existing panel edge channel. The original panel contour must be maintained. Weld the corner and channel edges as illustrated.

NOTE: Apply a little Viton to the centre of the patch and to the patch flanges, do not contaminate the area to be welded with sealant.

(4) Weld the cover patch to the panel and to the insert using a minimum two rows of spot welds (Ref. 20-26-31).

(5) Repair the graphite cloth, if necessary, as detailed in para. 6.

(6) On panels that do not have graphite cloth, seal the edges of the cover patch with a fillet of Viton (Ref. 20-22-12).

(7) Turn the panel over and repair the PTFE covering as detailed in para. 2.

F. Conclusion

(1) Refit the panel to the aircraft (Ref. 71-32-11, Removal/Installation).

NOTE: The panel may be fitted to the aircraft as soon as it is surface dry.

(2) Conclude as in para. 2.D.

8. Breather Assembly (plain stainless steel tray only)

A. Equipment and Materials

DESCRIPTION	PART NO.
Glass cloth (BAC M351)	-
B Viton PR1791A B (Ref. 20-30-00, No.392)	-
Breather tray	D55-4230-101
Breather plate	D55-4230-100

DESCRIPTION	PART NO.
Stainless steel sheet 0.005 in (0.127 mm) thick	S521
Spatula	-
Kimwipe tissue	-
Brush	-
Mains or portable electrical power source (see below)	-
Portable welding kit (Incorporall) 2KVA, for use on 110, 230 or 400V, 400 Hz complete with instruction manual (Ref. 20-26-31)	-

B. Prepare

(1) Comply with the instructions in para. 2.B.

C. Repair (Ref. Fig.807)

B NOTE: Seal with Viton PR1791A (20-22-12).

Spot-weld (Ref. 20-26-31).

(1) Support the panel on a suitable bench with the support tray uppermost.

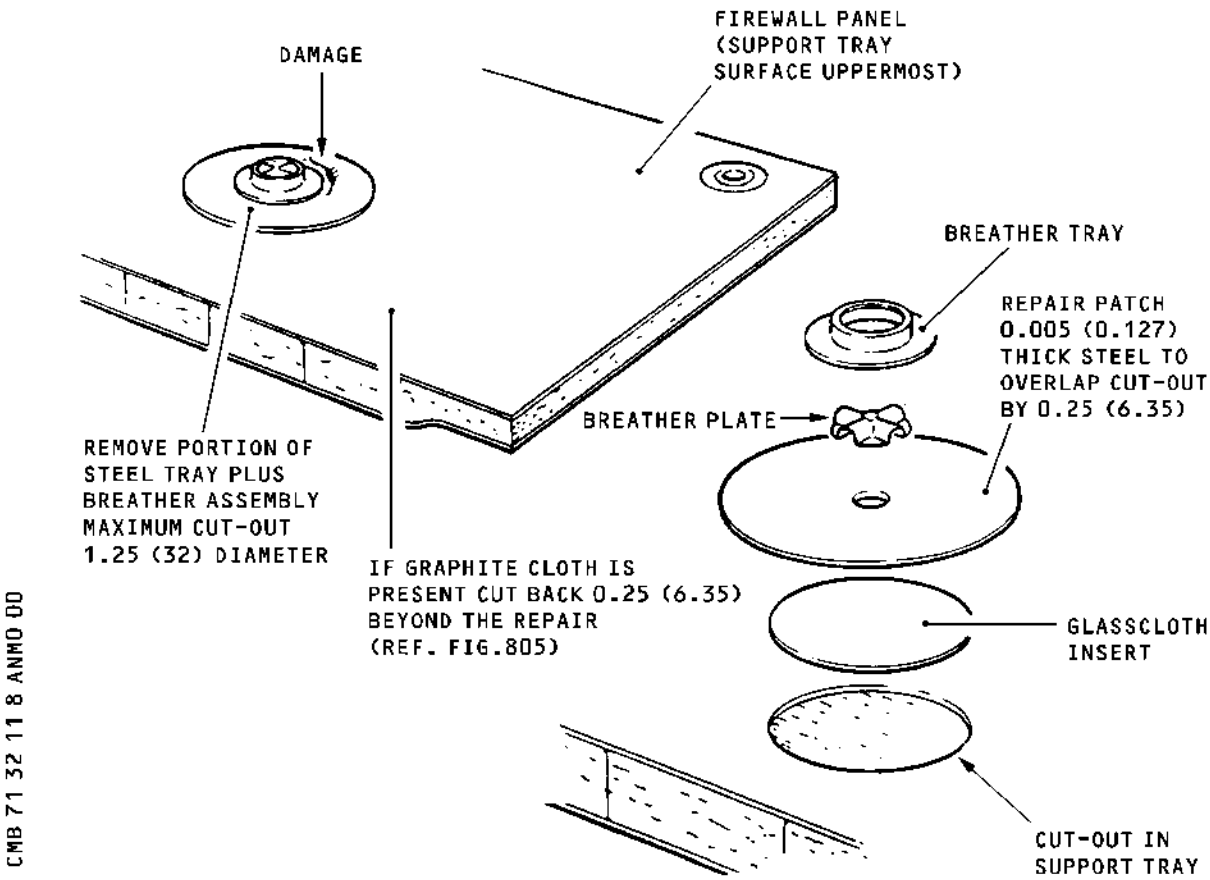
(3) Cut around the damaged area, removing a portion of the steel tray plus the breather assembly - the maximum cut-out is not to exceed 1.25 in (31.79 mm) diameter.

NOTE: Do not damage the fibreglass envelope.

If graphite cloth is present cut this away to 0.25 in (6.35 mm) beyond the edge of the metal (Ref. para. 6.).

(3) Cut a glasscloth insert and place it in the cut-out.

(4) Cut a steel patch to overlap the cut out by 0.25 in (6.35 mm). Make a 0.25 in (6.35 mm) diameter hole in the centre of the patch. Spot weld the patch over the cut-out with two rows of 0.05 in pitch approximately.



DIMENSIONS IN INCHES (MILLIMETRES IN BRACKETS)

Repair to a Breather Assembly
Figure 807

(5) Assemble the breather plate and tray over the hole and weld the breather tray to the repair patch with two rows of spot welds in the manner previously described.

(6) Seal the edge of the repair plate with Viton (Ref. 20-22-12) unless graphite cloth is to be fitted.

(7) If a graphite cloth repair is necessary carry this out in accordance with para. 6., replacing the graphite cloth as a ring to the edge of the breather tray.

D. Conclusion

(1) Refit the panel (Ref. 71-32-11, Removal/Installation).

(2) Conclude as in para. 2.D.

9. Chafe Damage in Cross Corrugated Primary Heat Shields at Spar 64 (Ref. Fig.808)

A. Equipment and Materials

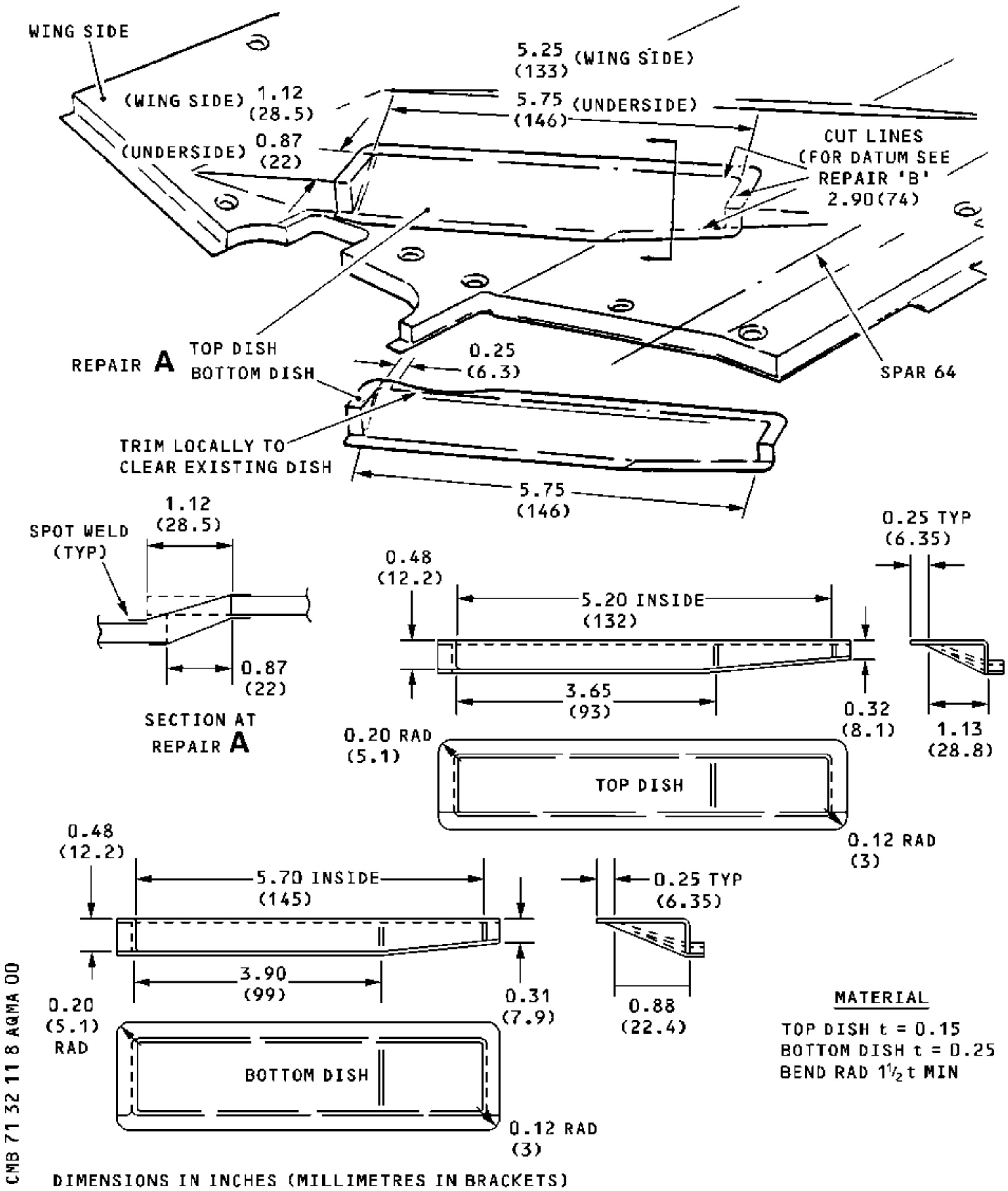
	DESCRIPTION	PART NO.
B B	Viton PR1791A (Ref. 20-30-00, No.392)	-
	Stainless steel sheet, plain, 0.010 in (0.2500 mm) thickness 0.006 in (0.1524 mm) thickness 0.028 in (0.7112 mm) thickness	CM230
	Portable grinding Machine with cutting wheel (thin)	-
	Sharp knife	-
	Min-K insulation BAC M350	
	Portable welding kit (Incorporall) 2KVA, for use on 110, 230 or 400V, 40/60 Hz, complete with instruction manual (Ref. 20-26-31)	-
	Mains or portable electrical power source for welding kit	

B. Prepare

(1) Comply with the instructions in para. 2.B. Prepare.

(2) Remove No.1 firewall panel of the bay concerned (Ref. 71-32-11, Removal/Installation).

(3) Support the panel on a suitable bench.



Repair to Primary Heat Shield at Spar 64
Figure 808 (Sheet 1 of 2)

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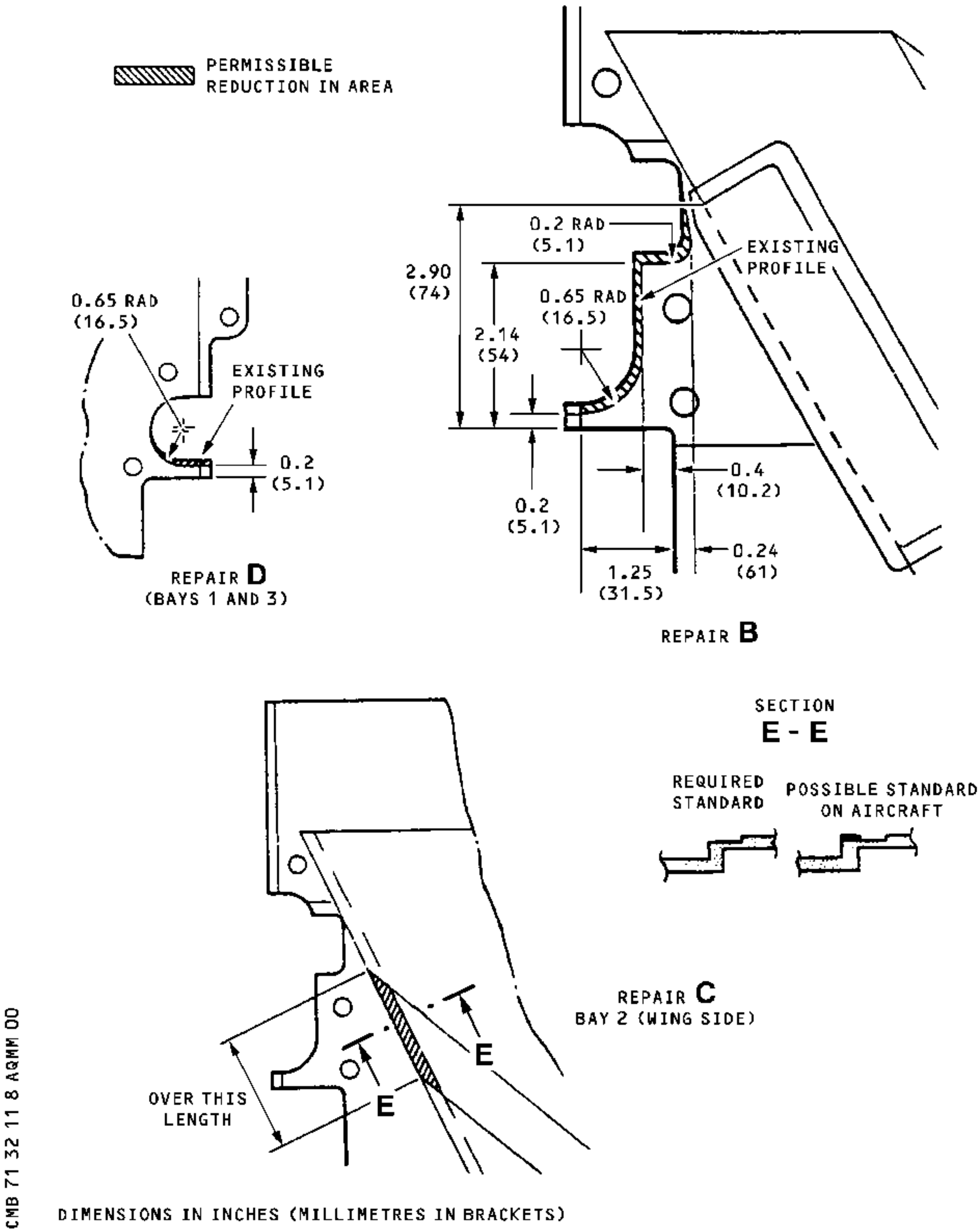

Repair to Primary Heat Shield at Spar 64
Figure 808 (Sheet 2 of 2)

C. Repair A (Engine Bay 4)

(1) Remove the Viton/glass fibre layer from the upper skin in the repair area. Mark out the cuts to be made in the skin and ensure that they align correctly on both sides of the panel (Ref. Fig.808).

(2) Cut the skin taking care not to damage the Min-K insulation envelope and remove the cut out pieces, leaving the insulation in place. If the envelope is damaged, it is to be temporarily supported.

(3) Mould the exposed insulation to the new shape. Seal any
B split or damage to the envelope with Viton PR1791A (Ref. 20-22-12).

(4) Manufacture repair items (1) and (2) (Ref. Fig.808) and fit them to the panel.

(5) Weld items (1) and (2) in position using the Incorporall welding kit. Make a minimum of two rows of welds (Ref. 20-26-31).

B (6) Seal the edges of the repair with Viton PR1791A. On upper skin, this application of Viton must overlap the existing fibreglass/Viton lining (Ref. 20-26-31).

D. Repairs B (Engine Bays 2 and 4) and D (Engine Bays 1 and 3)

(1) Mark out the cut on both sides of the panel.

(2) Cut the skin taking care not to damage the Min-K insulation envelope and remove the cut out pieces, leaving the insulation in place.

(3) Mould the insulation to the new shape. Seal any split or
B damage in the envelope with Viton PR1791A (Ref. 20-22-12).

(4) Deform the existing edge member to suit the new shape. If additional material is required, use 0.028 in (0.7112 mm) stainless steel.

(5) Weld the edge member into position using one row of spot welds (Ref. 20-26-31).

B (6) Seal the edges of repair with Viton PR1791A. On the upper skin, this application of Viton must overlap the existing Viton/fibre glass layer (Ref. 20-22-12 and 20-26-31).

E. Repair C (Engine Bay 2)

(1) Remove the Viton/glass fibre layer locally from the upper skin and cut away the ridge shown cross-hatched in repair C (Ref. Fig.808), taking care not to damage the Min-K insulation. Mould the insulation to the new shape and seal any split or damage in the envelope with Viton PR1791A (Ref. 20-22-12).

(2) Manufacture a repair piece from 0.006 in (0.1524 mm) stainless steel to overlap the cut-out area by 0.25 in (6.35 mm).

(3) Weld the repair piece in position using two rows of spot welds (Ref. 20-26-31).

B (4) Seal the edges of the repair with Viton PR1791A. On the upper skin, this application must overlap the existing Viton/fibreglass layer (Ref. 20-22-12 and 20-26-31).

F. Conclusion

(1) When the surface is dry, refit the panel to the aircraft (Ref. 71-32-11, Removal/Installation).

(2) After heat shields have been repaired and reinstalled, check that the corner seal plate immediately above the area of repair matches the new shape of the heat shield. If this is not so, dress the seal plate to match.

(3) Conclude as in para. 2.D.

(4) The engine may be refitted when other servicing tasks permit (Ref. 71-00-12, Removal/Installation).

TANTALUM AND STAINLESS STEEL HEAT SHIELDS - REMOVAL/INSTALLATION

WARNING: OPERATORS ARE ADVISED TO WEAR PROTECTIVE CLOTHING/EQUIPMENT WHEN HANDLING HEAT SHIELD PANELS. THIS SHOULD BE OVERALLS, GLOVES AND A SUITABLE RESPIRATORY PROTECTOR SUCH AS 3M'S DISPOSABLE FACEPIECE RESPIRATOR TYPE 8810 OR A SUITABLE APPROVED EQUIVALENT.

HEAT SHIELDS FOUND TO BE IN A DETERIORATED CONDITION SHOULD BE HANDLED CAREFULLY TO AVOID CREATION OF EXCESSIVE DUST.

REMOVED PANELS MUST BE SEALED IN PLASTIC BAGS BEFORE BEING DISPATCHED FOR REFURNISHFMENT.

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1. General

The Removal/Installation of the heat shields in No.1 engine bay is typical for all engine bays.

To remove these heat shields the appropriate engine and certain air conditioning system components, pipes and fittings must first be removed from the engine bay.

To remove a centrewall heat shield both engines in a nacelle must be removed.

2. Tantalum and Stainless Steel Heat Shields - Engine Bay Roof and Door

A. Equipment and Materials

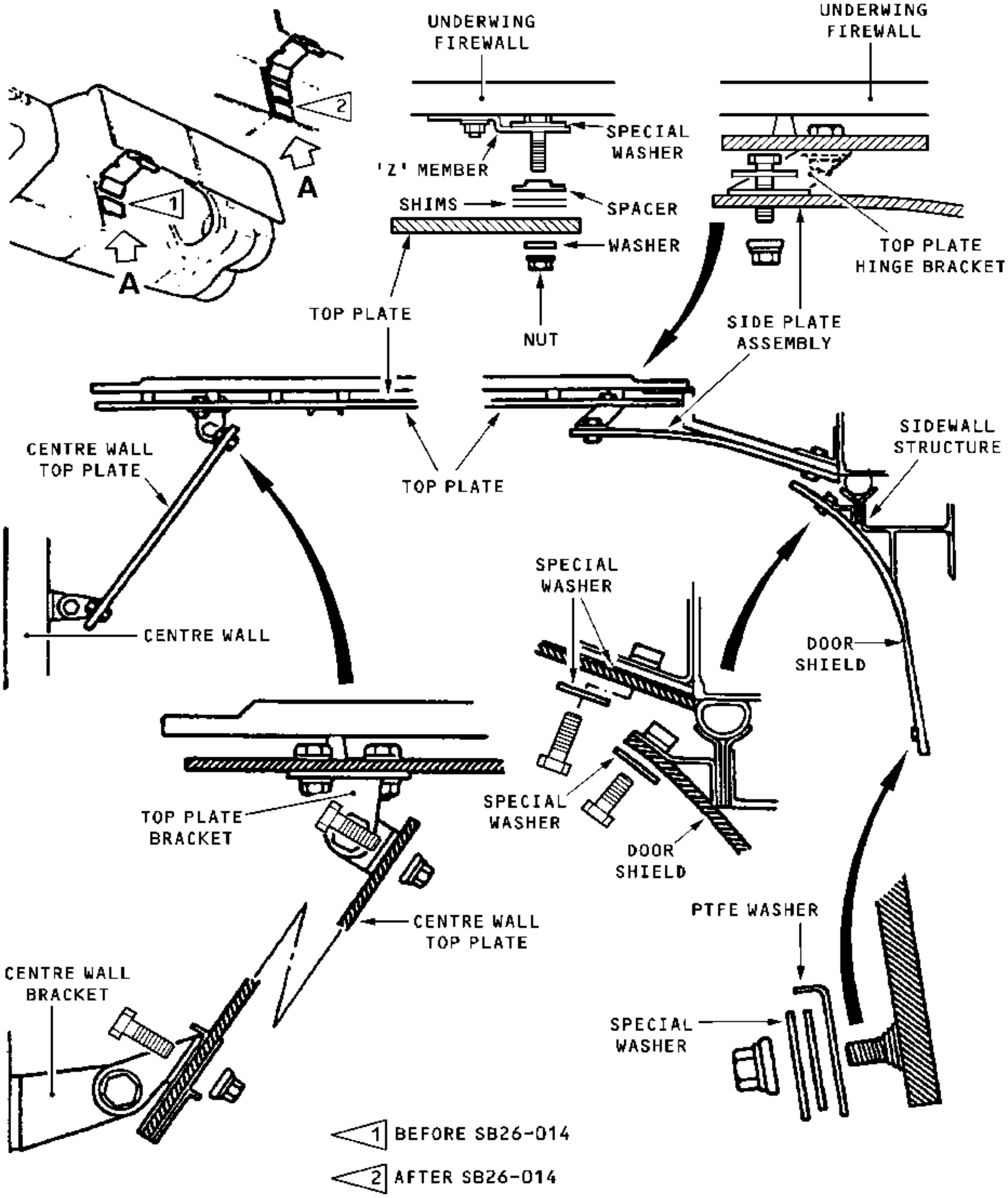
DESCRIPTION	PART NO.
Torque spanner 10 to 15 lbf in (0.11 to 0.17 mdaN)	-

B. Prepare to Remove

(1) Remove the engine (Ref. 71-00-12, Removal/Installation).

(2) Remove the air conditioning outlet ducts from the primary and secondary heat exchangers (Ref. 21-12-11 to 14, Removal/Installation).

(3) Remove the support brackets and fittings in the engine bay roof, which support the air conditioning system outlet ducts (Ref. 71-41-00).



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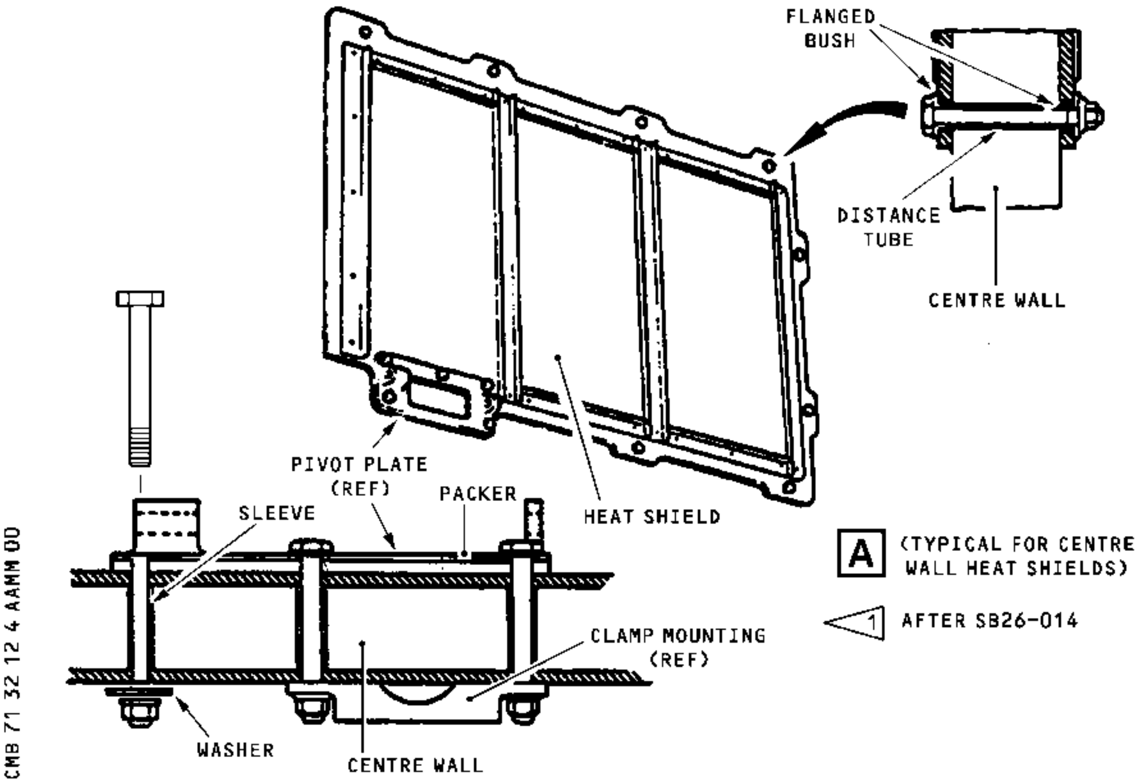
Tantalum and Stainless Steel Heat Shields -
Installation (Sheet 1 of 2)
Figure 401



Tantalum and Stainless Steel Heat Shields -
Installation (Sheet 2 of 2)
Figure 401

C. Remove (Ref. Fig.401)

(1) Remove the door shield:

(a) Remove the bolts securing the top of the door shield. Retain the washers.

(b) Support the door shield and remove the nuts securing the bottom of the door shield. Retain the washers.

(c) Remove the door shield.

(2) Remove the side plate assembly:

(a) Remove nuts securing side plate on door hinge line. Retain the washers.

(b) Support the side plate and remove the nuts securing the side plate to the hinge brackets of the top plate. Remove the side plate. Remove the charge air system bracket. Retain the washers.

(3) Remove the centrewall top plate assembly:

(a) Support the plate and remove the bolts securing the plate to the centrewall bracket.

(b) Support the plate and remove the bolts securing the plate to the top plate hinge brackets. Remove the plate.

(4) Remove the top plate:

(a) Support the top plate and remove the nuts securing the top plate to the 'Z' members. Retain the washers.

(b) Remove the top plate, shims and spacers.

NOTE: The bolts and special washers may be left temporarily in the 'Z' members. When removing the plate, note the number of shims at each bolting position.

D. Prepare to Install

(1) Comply with the safety precautions for engine removal (Ref. 71-00-12).

(2) Ensure that the firewall panels are installed (Ref. 71-32-11, Removal/Installation).

E. Install

(1) Install top plate:

(a) Check that a bolt and special washer are fitted at each bolt position in the 'Z' members.

(b) Fit a spacer and shims, if necessary, to each bolt as noted during plate removal.

(c) Engage the top plate with the bolts and secure at each position with a washer and nut.

(d) Torque load each nut to between 10 and 15 lbf in (0.11 and 0.17 mdaN).

(2) Install the centre wall top plate assembly.

(a) Engage the plate with the centrewall and top plate brackets.

(b) Secure the plate to the centrewall brackets at each position with a bolt and nut.

(c) Secure the plate to the top plate brackets at each position with a bolt and nut.

(d) Torque load each bolt to between 10 and 15 lbf in (0.11 and 0.17 mdaN).

(3) Install the side plate assembly:

(a) Position the sideplate with the hinge brackets and with the sidewall structure. Secure it to the hinge brackets of the top plate with a bolt, special washer (under the head), charge air system bracket and nut at each position.

(b) Insert the special washers between the sideplate and the structure. Secure the sideplate at each position with washers and nuts or bolts as appropriate.

(c) Check that there is a minimum clearance of 0.25 in (6.35 mm) with the primary heat exchanger exhaust ducts (Ref. 21-12-11).

(d) Torque load each bolt to between 10 and 15 lbf in (0.11 and 0.17 mdaN).

(4) Install the door shield:

(a) Engage the door shield with the structure.

(b) Secure the shield at the top with a bolt and special washer at each position.

(c) Secure the shield at the bottom with a PTFE washer, special washer and a nut at each position.

(d) Torque load the top bolts to between 10 and 15 lbf in (0.11 and 0.17 mdaN).

(e) Torque load the bottom nuts to between 10 and 15 lbf in (0.11 and 0.17 mdaN).

F. Conclusion

(1) Install the engine bay support brackets and fittings previously removed (Ref. 71-41-00).

(2) Install the air conditioning charge air outlet ducts from the primary and secondary heat exchangers (Ref. 21-12-11 to 14, Removal/Installation).

(3) Install the engine (Ref. 71-00-12, Removal/Installation) on completion of all other servicing tasks.

3. Centrewall Heat Shield Assembly

NOTE: After SB 26-014, two additional zirconium heat shields are fitted. The Removal/Installation of all centrewall heat shields is similar.

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner range: 0 to 50 lbf in (0 to 0.565 mdaN)	-

B. Prepare to Remove

(1) Remove both engines from the nacelle (Ref. 71-00-12, Removal/Installation).

C. Remove (Ref. Fig.401)

(1) Remove the bolts (5 off) securing the pivot plate, clamp mounting and heat shields just aft of the centrewall joint. Retain the washers and sleeves.

NOTE: The bolts pass right through the centrewall and secure the brackets in both engine bays.

(2) Remove the bolts (8 off) securing the heat shields and retain the flanged bushes and distance tubes. Remove the heat shields.

NOTE: The bolts pass through the centrewall and secure the heat shields in both engine bays.

D. Prepare to Install

(1) Comply with the safety precautions associated with engine removal.

(2) Ensure that the area is clean.

E. Install (Ref. Fig.401).

(1) Check that the distant tubes are in the centrewall at each bolting position.

(2) Position all centrewall heat shields with the centrewall and secure them with a flanged bush, bolt, flanged bush and nut at eight positions.

(3) Locate the pivot plate and packer (in No.1 and 3 engine bays) and the clamp mounting (in No.2 and 4 engine bays) on the heat shields and secure the whole assembly with bolts, sleeves, washers (where shown) and nuts.

(4) Torque load the nuts to between 30 and 40 lbf in (0.34 and 0.45 mdaN).

F. Conclusion

(1) Install the engines (Ref. 71-00-12, Removal/Installation) on completion of all other servicing tasks.

TANTALUM AND STAINLESS STEEL HEAT SHIELDS - INSPECTION/CHECK

WARNING: DAMAGE TO THE TANTALUM HEAT SHIELDS, IN EXCESS OF THE PERMISSIBLE DAMAGE (REF. FIG. 601), IS A HAZARD TO THE SAFETY OF THE AIRCRAFT.

HEAT SHIELDS FOUND TO BE IN A SEVERELY DETERIORATED CONDITION SHOULD BE CAREFULLY HANDLED TO AVOID CREATING DUST.

REMOVED PANELS MUST BE SEALED IN PLASTIC BAGS PRIOR TO DISPATCH FOR REFURBISHING.

R OPERATORS ARE ADVISED TO WEAR PROTECTIVE CLOTHING/
R EQUIPMENT WHEN HANDLING HEAT SHIELDS. THIS SHOULD BE
R OVERALLS, GLOVES AND A SUITABLE RESPIRATORY PROTECTIVE
R SUCH AS 3M's DISPOSABLE FACEPIECE RESPIRATOR TYPE 8810
R OR A SUITABLE APPROVED EQUIVALENT.

1. General

The following inspection assumes that the aircraft is placed in a maintenance status with engine bay doors open and engine removed.

2. Tantalum Heat Shields

A. Equipment and Materials

DESCRIPTION	PART NO.
Rigid introscope (approximately 1.5 metres in length)	-
Torque spanner, 30 to 40 lbf in (0.34 to 0.45 mdaN)	-
Torque spanner, 10 to 15 lbf in (0.11 to 0.17 mdaN)	-

B. Prepare

Before SB 71-075

(1) Remove sideplate assembly, door shield and top plates in accordance with 71-32-12, Removal/Installation.

After SB 71-075

(1) Remove top plate in accordance with 71-32-12, Removal/Installation.

C. Inspect (Ref. Fig. 601, 602, 603 and 604)

(1) Examine the edges and corners of plates for impact damage, cracks and crushing.

(2) Check tantalum surface for waviness, signs of heat distortion or oxidation.

(3) Inspect heat shields for evidence of dents, scratches, scores and chafing of the disilicide coating and for evidence of deterioration of Durestos backing board (Ref. Fig. 604).

(4) Where a heat shield is found to have significant deterioration visually inspect the structure behind the heat shield to ensure that there is no evidence of overheating.

After SB 71-075

(5) Inspect sideplate assembly and door shield for security.

(a) Check the security of the heat shield nuts and bolts. Centrewall heat shield nuts and bolts only, 30 to 40 lbf in (0.34 to 0.45 mdaN), all others 10 to 15 lbf in (0.11 to 0.17 mdaN).

(b) Check the security of the supporting brackets by attempting to move individual heat shields. Visually examine the brackets using the introscope as necessary.

After SB 71-076

(c) Replace damaged temperature sensitive wires on the sidewall firewire plate in accordance with 71-32-17.

D. Conclusion

Before SB 71-075

(1) Install serviceable sideplate assembly, door shield and top plate in accordance with 71-32-12, Removal/Installation.

<table>
<tr><th>DESCRIPTION AND TYPE OF DAMAGE</th><th>LIMITATIONS</th></tr>
<tr><td>Scores, scratches and chafing of the disilicide coating which expose the tantalum surface.</td><td>Length 0.25 in (6.35 mm) max.
Width 0.04 in (1.016 mm) max.
Distance between marks 10 in (254 mm) minimum.</td></tr>
<tr><td>Smooth dents.
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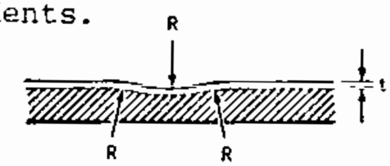
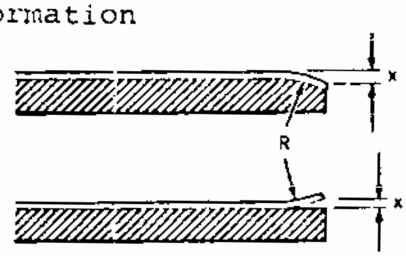
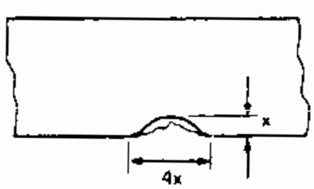

</td><td>Thickness of tantalum shield t = 0.015 in (0.381 mm)
Max depth of dent = 0.015 in (0.381 mm)
Min radius R = 0.15 in (3.81 mm)</td></tr>
<tr><td>Edge deformation

</td><td>Max deformation x = 0.125 in (3.175 mm)
Min radius R = 0.15 in (3.81 mm)
No cracks allowed
No interference or fretting with other parts allowed.</td></tr>
<tr><td>Ragged edge damage.

</td><td>Damage within the permitted limits to be blended out as illustrated using a smooth file.

x = 0.150 in (3.81 mm) max.</td></tr>
<tr><td>Sharp peaked dent or puncture
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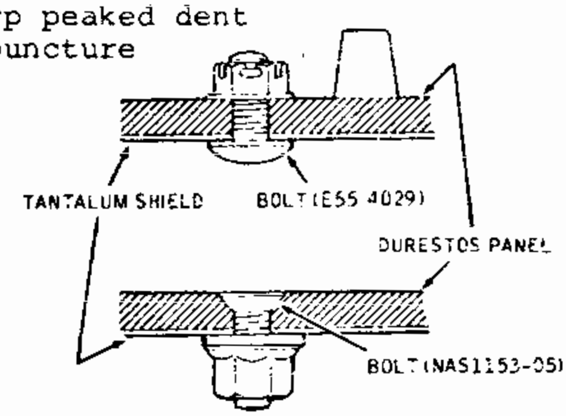
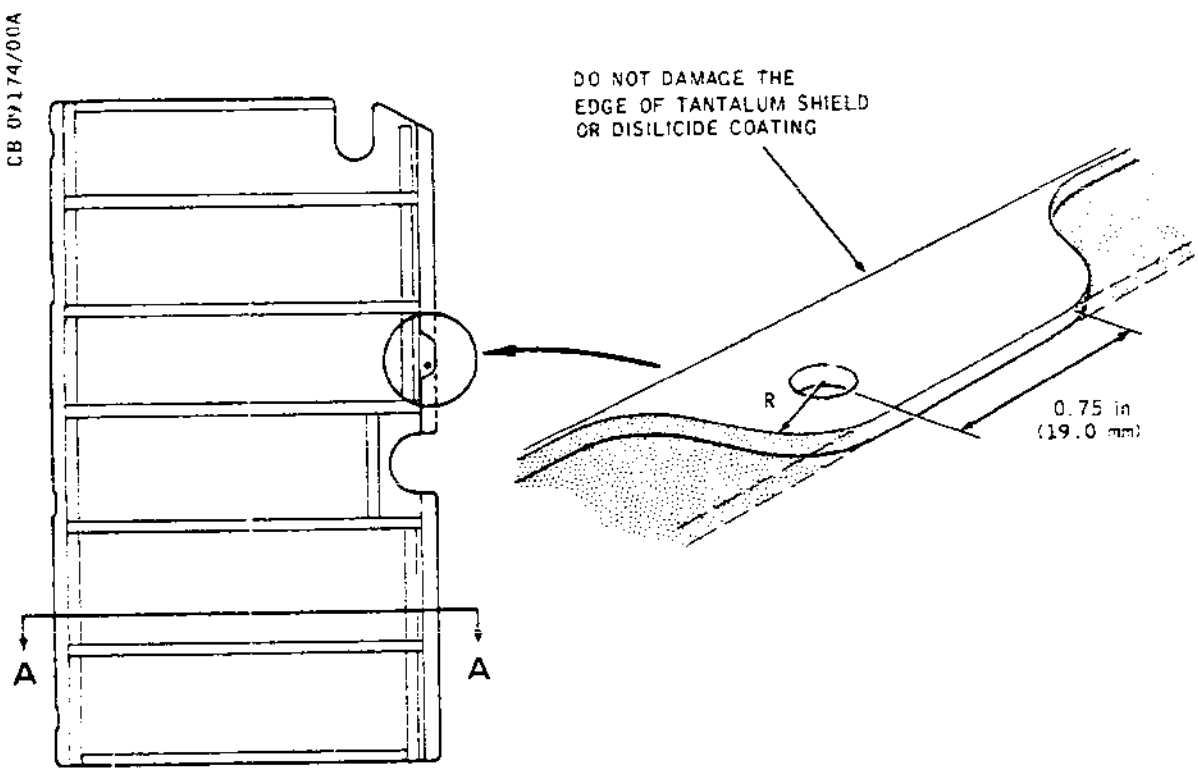

</td><td>Not permitted, may be rectified as below:

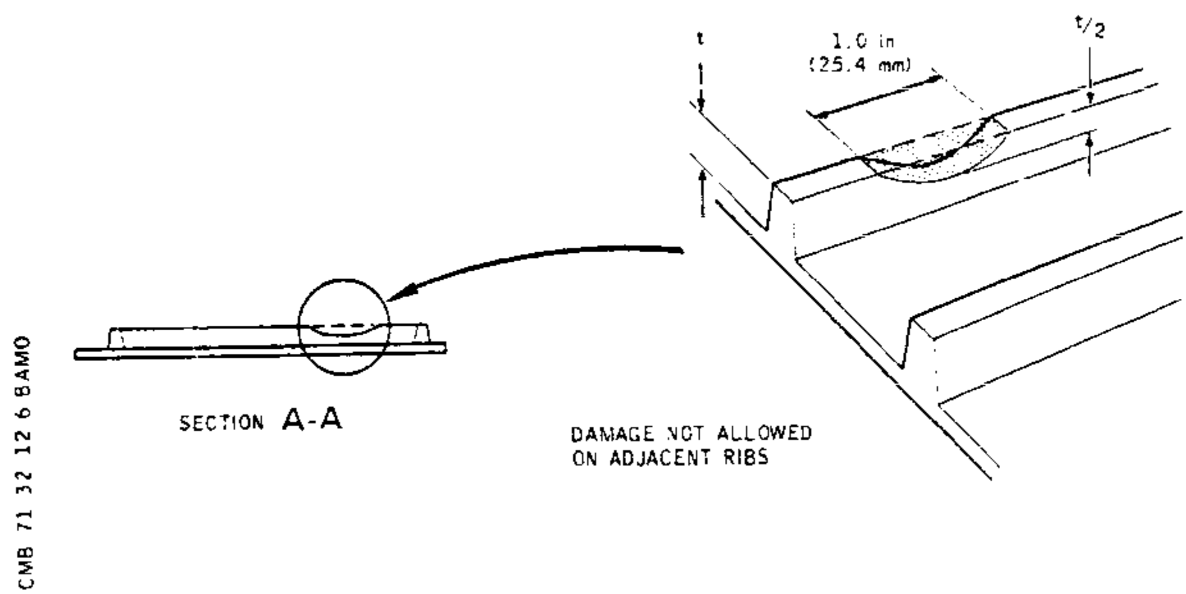
Top Plate heatshield - at intervals of not less than 10 in (254 mm), damage may be removed by drilling and plugging with special bolt E55.4029 as shown.

Centrewall heatshield - drilling and plugging permitted once only for panel using bolt NAS1153-05 as shown.</td></tr>
<tr><td>Cracks</td><td>Not permitted.</td></tr>
</table>

R

Tantalum Heatshields - Permissible Damage
Figure 601





Durestos Panels - Permissible Damage
Figure 602

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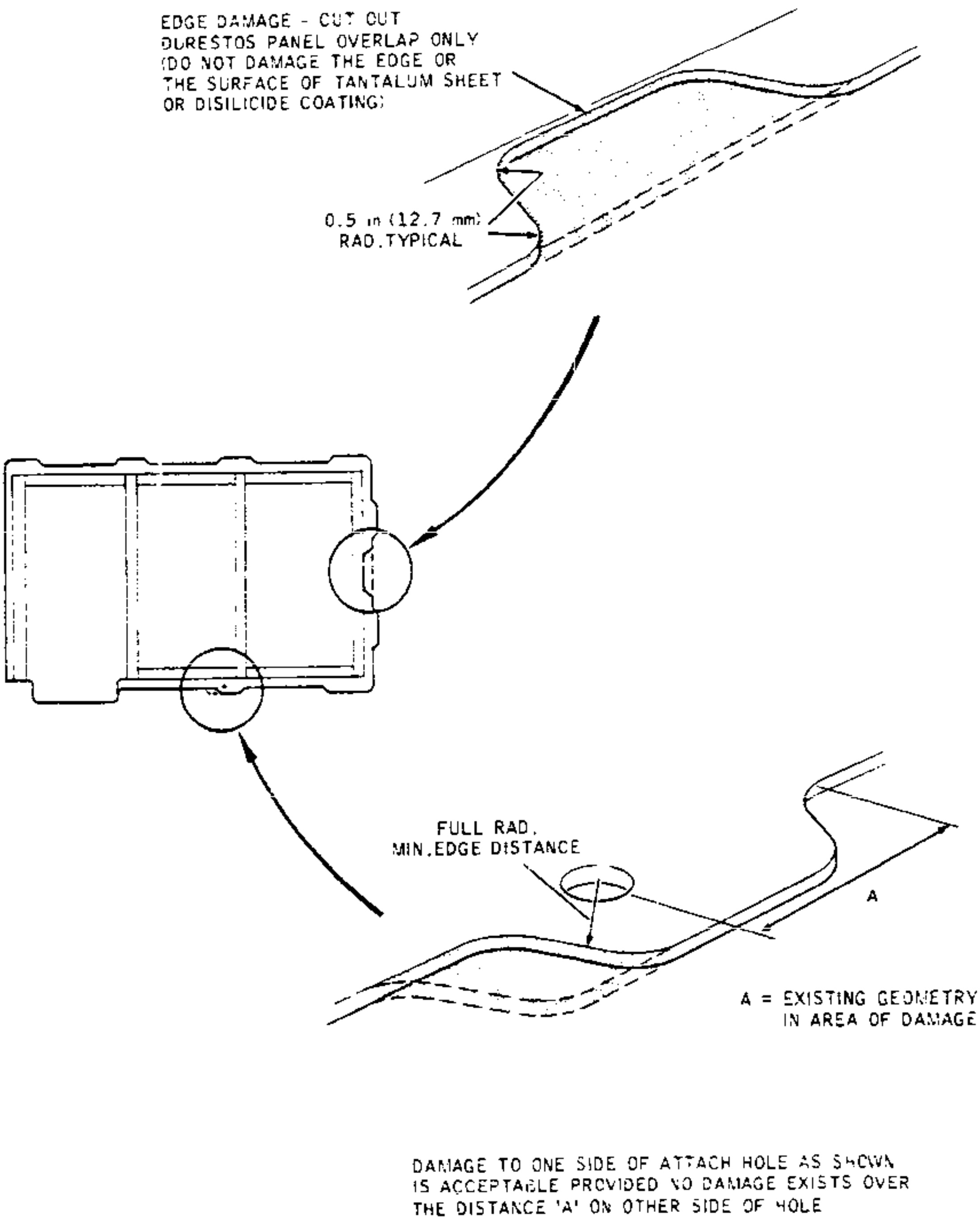

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Durestos Panels - Permissible Damage
Figure 603

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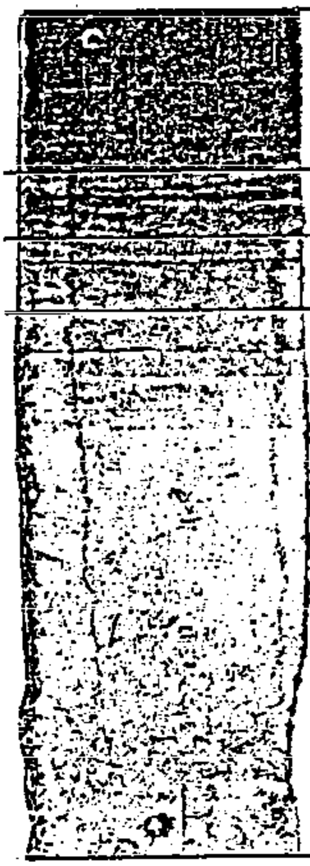

DEGRADED DURESTOS PANEL	COLOUR/TEXTURE CHANGE	ACCEPTABLE DAMAGE
	DARK BROWN WITH LIGHTER WATER MARKS - HARD AND SMOOTH OR LIGHTLY TEXTURED	UNDAMAGED - ACCEPTABLE FOR ALL PANELS
	GRADUAL LOCAL COLOUR CHANGE TO SMALL AREAS OF GREY WITH SOME SOFTENING IN TEXTURE	ACCEPTABLE FOR TOP PLATES; UNACCEPTABLE FOR SIDEPLATE/DOOR SHIELD
		ACCEPTABLE FOR TOP PLATES, PROVIDED DAMAGED AREA DOES NOT EXCEED TOTAL 8sq.in (51sq.cms)
	PALE GREY - SOFT, FIBROUS TEXTURE	UNACCEPTABLE FOR ALL PANELS

NOTE: IF REQUIRED A DEGRADED DURESTOS PANEL SAMPLE (SIMILAR TO THAT PROVIDED WITH SB71-074) IS AVAILABLE

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Durestos Backing Panel - Acceptable Damage
Figure 604

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After SB 71-075

(1) Install serviceable top plate in accordance with 71-32-12, Removal/Installation.

3. Stainless Steel Heat shields

A. Equipment and Materials

DESCRIPTION	PART NO.
Rigid introscope (approximately 1.5 metres in length)	-
Torque spanner, 30 to 40 lbf in (0.34 to 0.45 mdaN)	-
Torque spanner, 10 to 15 lbf in (0.11 to 0.17 mdaN)	-

B. Prepare

(1) Remove side plate assembly and door shield in accordance with 71-32-12, Removal/Installation.

C. Inspection (Ref. Table 601)

(1) Examine the edges and corners of plates for cracks and impact damage.

(2) Check zirconia surfaces for signs of heat distortion or oxidation.

(3) Inspect heat shields for evidence of cracks, score marks, gouges and chafing.

(4) Where a heat shield is found to have signifcant deterioration, visually inspect the structure behind the heat shield to ensure that there is no evidence of overheating.

After SB 71-076

(5) Replace damaged temperature sensitive wires on the sidewall firewire plate in accordance with 71-32-17 Removal/Installation.

DESCRIPTION AND TYPE OF DAMAGE	LIMITATIONS
Category (a) Hairline cracks	The Zirconia coating on each side of the crack must be firmly attached to the stainless steel substrate. The distance between adjacent cracks must be at least 5.0 in (127.0 mm)
Category (b) Score marks, gouges and missing pieces	Damage marks that pentrate the Zirconia coating to any depth within 0.050 in (1.27 mm) of the stainless steel substrate are not acceptable. Within 1.5 in (38.0 mm) of either the forward or rear edges of the panel - the following damage is allowable:- Missing pieces of Zirconia exposing the stainless steel substrate but not more than 0.2 in^2 (1.30 cm^2)

Permissible Damage
Table 601

D. Conclusion

(1) Install serviceable side plate assembly and door shield in accordance with 71-32-12 Removal/Installation.

SECONDARY HEAT SHIELDS - REMOVAL/INSTALLATION

WARNING: IT IS ESSENTIAL THAT SECONDARY HEAT SHIELDS ARE COMPLETE AND INTACT OTHERWISE THE FIRE RESISTANT BARRIER WILL BE PENETRATED WHEN SUBJECTED TO FIRE.

1. General

A limited number of secondary heat shield are accessible with the engine installed and the engine bay doors open. These include heat shields which have to be removed to facilitate an engine change. To gain access to the majority of secondary heat shields, however, it is necessary first to remove the engine.
Secondary heat shields encasing services in the engine bay roof are of a split clamp or muff type, which have to be removed before the duct or pipe is disconnected, and a second ring type heat shield secured to the firewall. These instructions are in general terms; for precise details of the removal for a particular heat shield refer to the associated component removal topic.
The main fuel feed pipe and heat shields in each engine bay are removable with the engine installed (Ref. 28-21-00).

2. Heat shields

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner range: 0-10 lbf in (0-0.11 mdaN)	-
Locking wire to DTD 189 0.018 in (0.51 mm) dia	-
Locking wire (Nimonic) to DTD747 0.028 in (0.71 mm) dia	- -
Torque limiting screwdriver range: 40-45 lbf in (0.45 - 0.51 mdaN) 30-40 lbf in (0.34 - 0.45 mdaN)	-
Glass fibre tape 1in (25.4 mm) wide 0.007 in (0.18 mm) thick.	-
Glass fibre tape 1in (25.4 mm)	

DESCRIPTION	PART NO.
wide 0.0035 in (0.09 mm) thick.	-
Rhodorsil Elastomer CAF 4 (Ref.20-30-00, No.313)	-

B. Prepare

(1) Remove, if necessary, the engine (Ref. 71-00-12, Removal/Installation).

(2) Remove, if necessary, the primary and secondary heat exchangers and ducting (Ref. 21-12-11 to 21-12-14, Removal/Installation).

(3) Remove any fixed fittings or services required for access to the particular secondary heat shields.

C. Remove (Ref. Fig. 401)

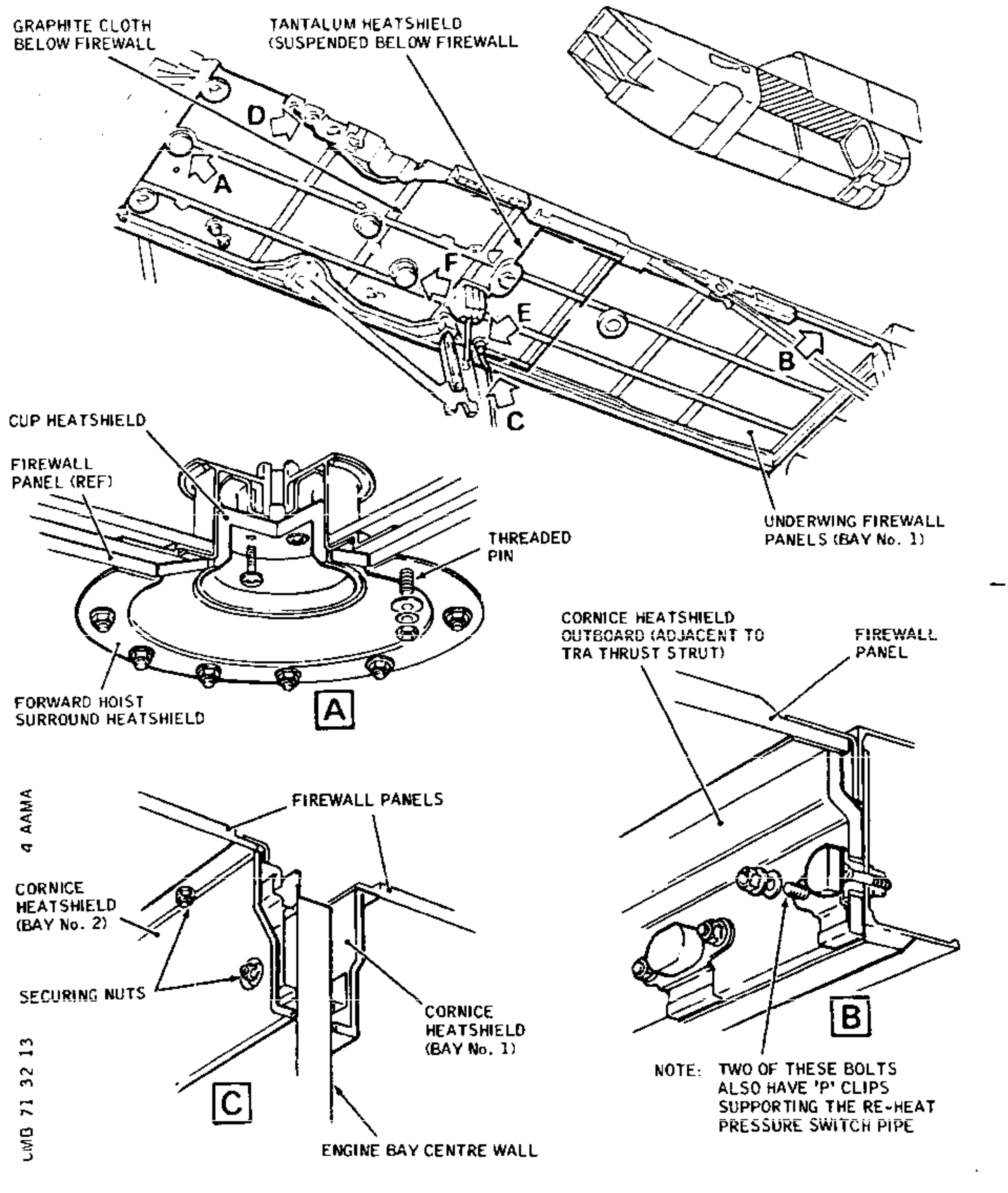
(1) Remove secondary heat shields from engine bay roof:

(a) For air conditioning ducts, remove the locking wire and screws securing the muff assembly. Disconnect and remove the duct (Ref. 21-12-11 to 14). Remove the nuts and the heat shield ring secured to the firewall panel. Note the location of attaching parts.

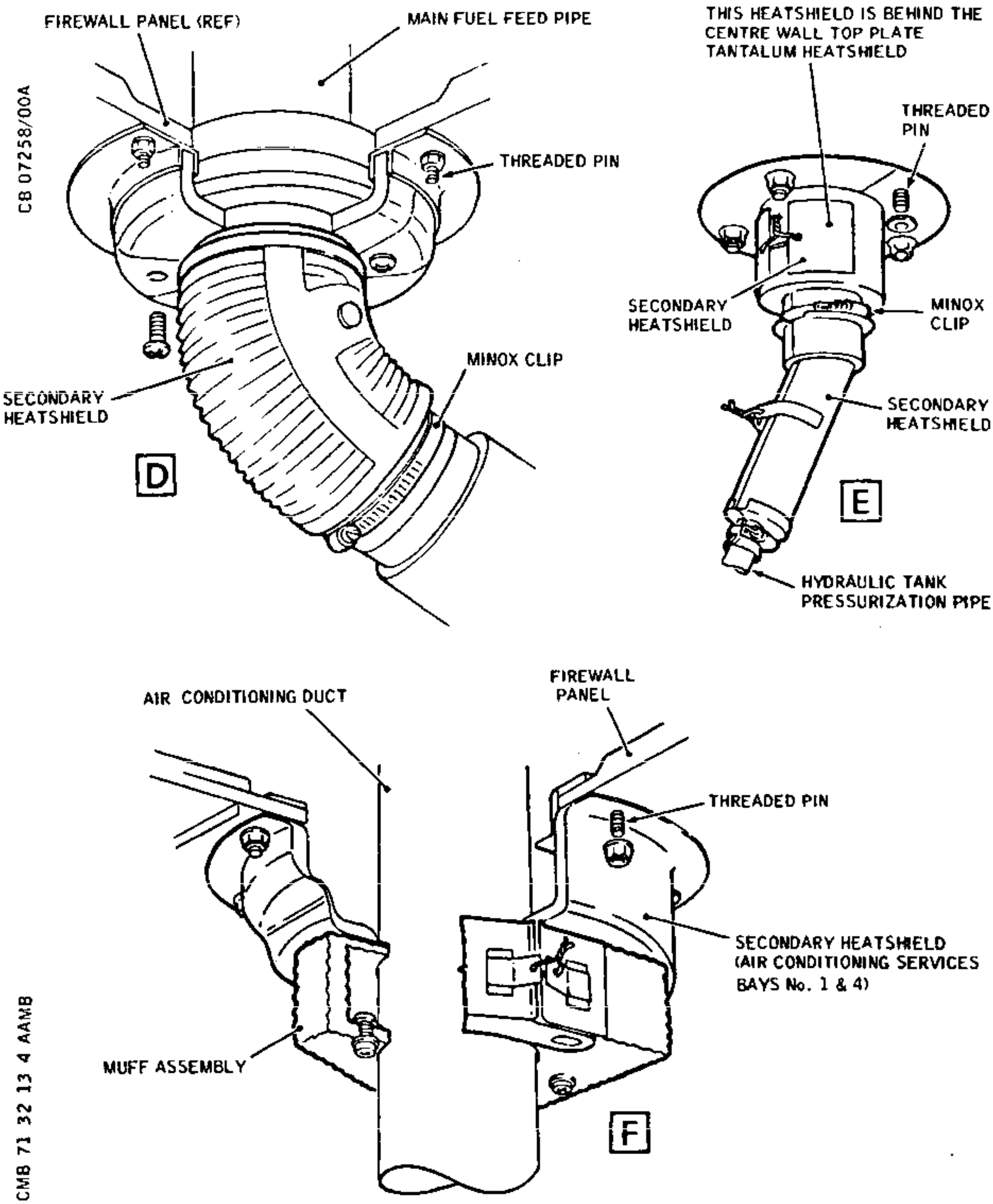
(b) For hydraulic pipes, remove the Minox clips and clamp halves. Disconnect and remove the pipe(s) (Ref. 29-00-00). Remove the nuts and the heat shield secured to the firewall panels. Note the location of attaching parts. To remove the hydraulic tank pressurization pipe illustrated it is first necessary to remove the centre wall top plate tantalum heat shield (Ref. 71-31-12, Removal/Installation).

<u>NOTE</u>: 1. Secondary heatshields encasing other services in the engine bay are removed in a similar manner.

2. The cup heatshields, which are at the centre of the forward and aft hoist



Secondary Heat Shield - Installation
(Sheet 1 of 2)
Figure 401



Secondary Heat Shield - Installation
(Sheet 2 of 2)
Figure 401

surround heatshields, are secured to detachable plugs. The plugs are normally removed from above the wing during an engine change (Ref 71-00-12, Removal/Installation).

(2) Remove cornice heat shields from the top of centre wall and on the engine bay outer wall:

(a) Remove the nuts or screws securing the heat shield to the centrewall or longeron brackets; remove the nuts and washers securing the heat-shield to the firewall. Note the location of attaching parts. Two of the bolts securing the cornice heat shield illustrated also have P-clips for supporting the reheat pressure switch pipe.

NOTE: For access to the centre wall cornice heat shield illustrated it is first necessary to remove the centre wall top plate tantalum heat shield (Ref. 71-31-12).

D. Prepare to Install

(1) Comply with the electrical safety precautions.

(2) On heatshields which have glass fibre tape, check the condition of the tape and where necessary renew.

E. Install (Ref. Fig. 401)

NOTE: Wirelock in accordance with 20-21-13. Where wire-locking is required, wire to DTD189 is to be used in areas forward of the engine main trunnions, but wire to DTD 747 is to be used in areas rearward of the trunnions.

Nuts on heat shields secured to firewall threaded pins are to be torque tightened to 20 lbf in. (0.226 mdaN) then slacken back one complete turn.

(1) Secure the heat shields to the firewall panels and engine bay roof apertures, together with any fixed fittings or brackets noted on removal. Torque load the nuts to the standard torque.

(2) Connect the air conditioning duct, hydraulic pipe or other service.

(3) Secure the muff or clamps with screws and clips.

Torque load 10-32 UNJF screws to between 40 and 45 lbf in (0.45 and 0.51 mdaN) where they screw into anchor nuts. Muff and clamps are to be wirelocked in two places. Torque load Minox clips NSA 5522-007 -011 and NSA 5522-007-019 to 8lbf in (0.09 mdaN), and all other Minox clips to between 14 and 18 lbf in (0.16 and 0.2 mdaN).

NOTE: When fitting new secondary heat shields the 0.25 in (6.35 mm) holes may be elongated in any direction to match mating holes.

(4) Refit cornice heat shields to top of engine bay centre wall and on door hinge line. Secure them with nuts and washers to the firewall, and with screws or bolts to the centrewall or longeron brackets. Other attaching parts are to be fitted in the order noted during removal. Torque load the firewall nuts to the standard torque.

F. Conclusion

(1) Carry out the test procedures on the pipes or services that have been disturbed.

(2) Replace any fixed fittings removed for access.

(3) Refit, if necessary the primary and secondary heat exchangers and ducting (Ref. 21-12-11 to 21-12-14, Removal/Installation).

(4) The engine may be installed when other servicing permits (Ref. 71-00-12, Removal/Installation).

BALANCE STRUT HEAT SHIELD (LINK COVER) - APPROVED REPAIRS

1. General

The balance strut heat shield, secured to the engine bay centrewall, protects the wing aperture for the engine thrust balancing strut (Ref. 71-21-00) against fire. The heat shield is fitted with a number of non-metallic seals on its lower edge and on the aperture edges which surround the thrust strut. The seal ends are mitred and stuck together with adhesive where the seal line changes direction.

Seal renewal necessitates the removal of the balance strut heat shield from the engine bay (Ref. 71-32-13, Removal/Installation).

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2. Balance Strut Heat Shield Seals

A. Equipment and Materials.

DESCRIPTION	PART NO.
Solvent BAC M302 (Ref. 20-30-00, No.473)	-
Abrasive paper grade 240/320	-
Adhesive RTV731 (Ref. 20-30-00, No.364)	-

B. Preparation.

(1) Remove the damaged seal using BAC M302 solvent to dissolve the adhesive.

(2) Remove residual adhesive from the inner surface of the capping strip and seal plate using abrasive paper grade 240/320.

C. Repair

(1) Using a suitable length of new seal, trim the seal to suit the heat shield, allowing for mitred joints where necessary.

(2) Apply the adhesive and bond the seal to the structure in accordance with 20-25-12, ensuring that the seal rests in the seal channel.

FORWARD CENTREWALL FIRE BARRIER-
REMOVAL/INSTALLATION

1. General

Both engines must be removed from the nacelle to gain access to the forward centrewall fire barriers. The barriers in adjacent bays use the same attaching parts and therefore cannot be removed individually.

Forward Centrewall Fire Barrier

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner range: 0-50 lbf in (0-0.565 mdaN)	-

B. Prepare to remove

(1) Remove both engines from the nacelle (Ref.71-00-12, Removal/Installation).

C. Remove (Ref.Fig.401)

(1) Remove and retain 18 nuts bolts and washers (A) and 54 washers (3) securing fire barrier and retaining angles to centrewall ensuring that the sleeves are retained in the centrewall.

NOTE: The bolts pass right through the centrewall and secure the retaining angles in both engine bays.

(2) Remove fire barrier and retaining angles.

D. Prepare to Install

(1) Ensure that the area is clean.

E. Install (Ref.Fig.401)

(1) Check that the sleeves in the centrewall are correctly positioned.

(2) Position both centrewall fire barriers and their respective retaining angles on the centrewall and secure them with a bolt, washers and nut at 18 positions.

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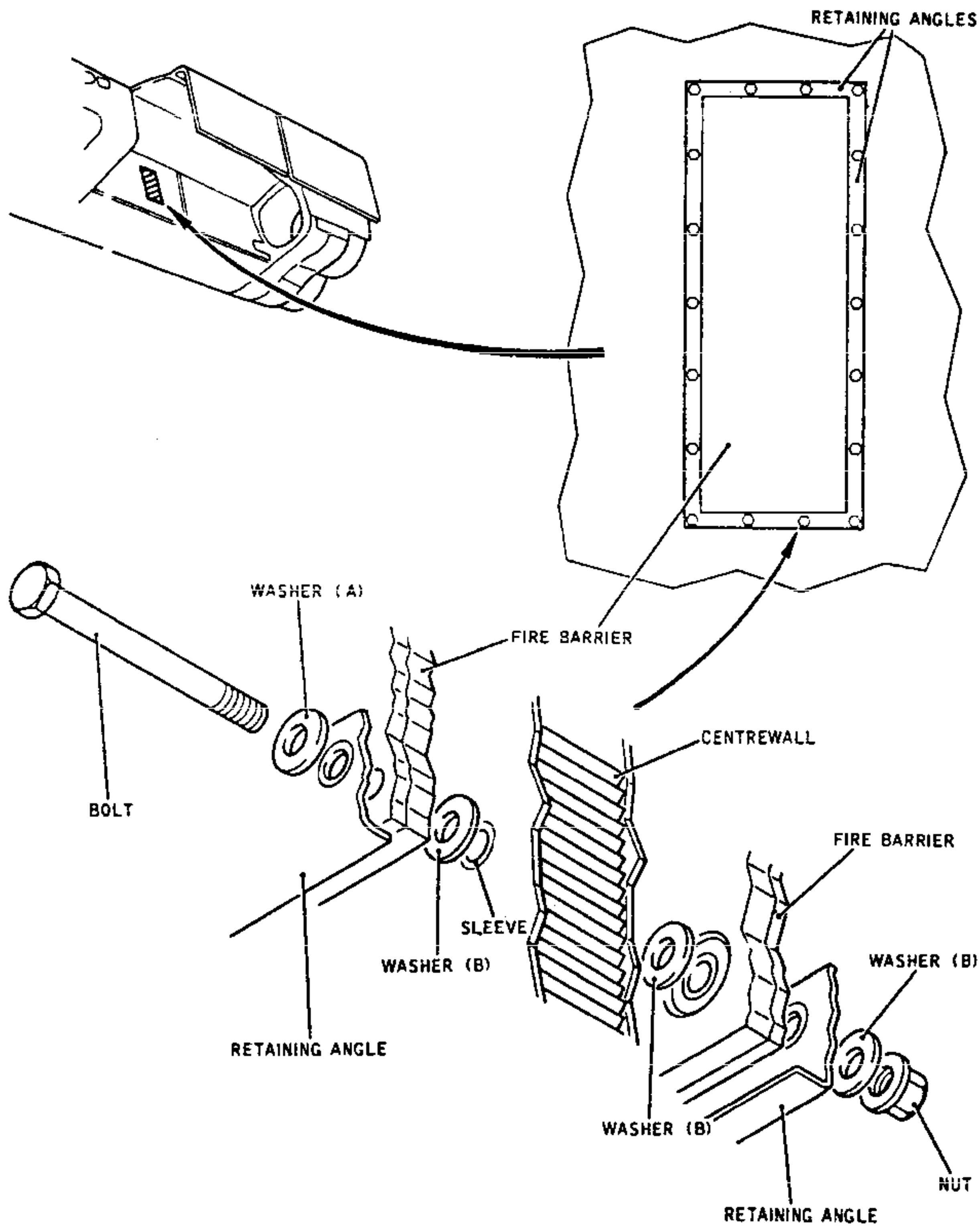

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Forward Centrewall Fire Barrier
Figure 401

(3) Torque load the nuts to between 30 and 40 lbf in (0.34 and 0.45 mdaN).

F. Conclusion

(1) Install the engines (Ref.71-00-12, Removal/Installation) on completion of all other servicing tasks.

R TEMPERATURE SENSITIVE WIRE
R REMOVAL/INSTALLATION

WARNING: THERE IS NO ALTERNATIVE TEMPERATURE SENSITIVE WIRE - THE HEAT RANGE IS CRITICAL AND THE USE OF INCORRECT WIRE COULD AFFECT HEATSHIELD SERVICEABILITY.

1. General (Ref. Fig. 401)

Damage to temperature sensitive wires is indicative of a hot air leak. No extension to the inspection of engine bay heatshields is permissible and a check for leakage from the hot air pipes is to be carried out. The wires in bays 1 and 4 are positioned in a similar manner to bays 2 and 3.

2. Temperature Sensitive Wire-Sidewall Firewire Plate

A. Equipment and Materials

DESCRIPTION	PART NO.
Primer (Ref.MM 20-25-12)	RTV 1200
Rubber grommet	BAS 8370
Sealant (Ref MM 20-25-12)	RTV 732
Solder to BS219 T1,T2 or T3 Ref. WARNING	ND E55.4569.000

B. Prepare

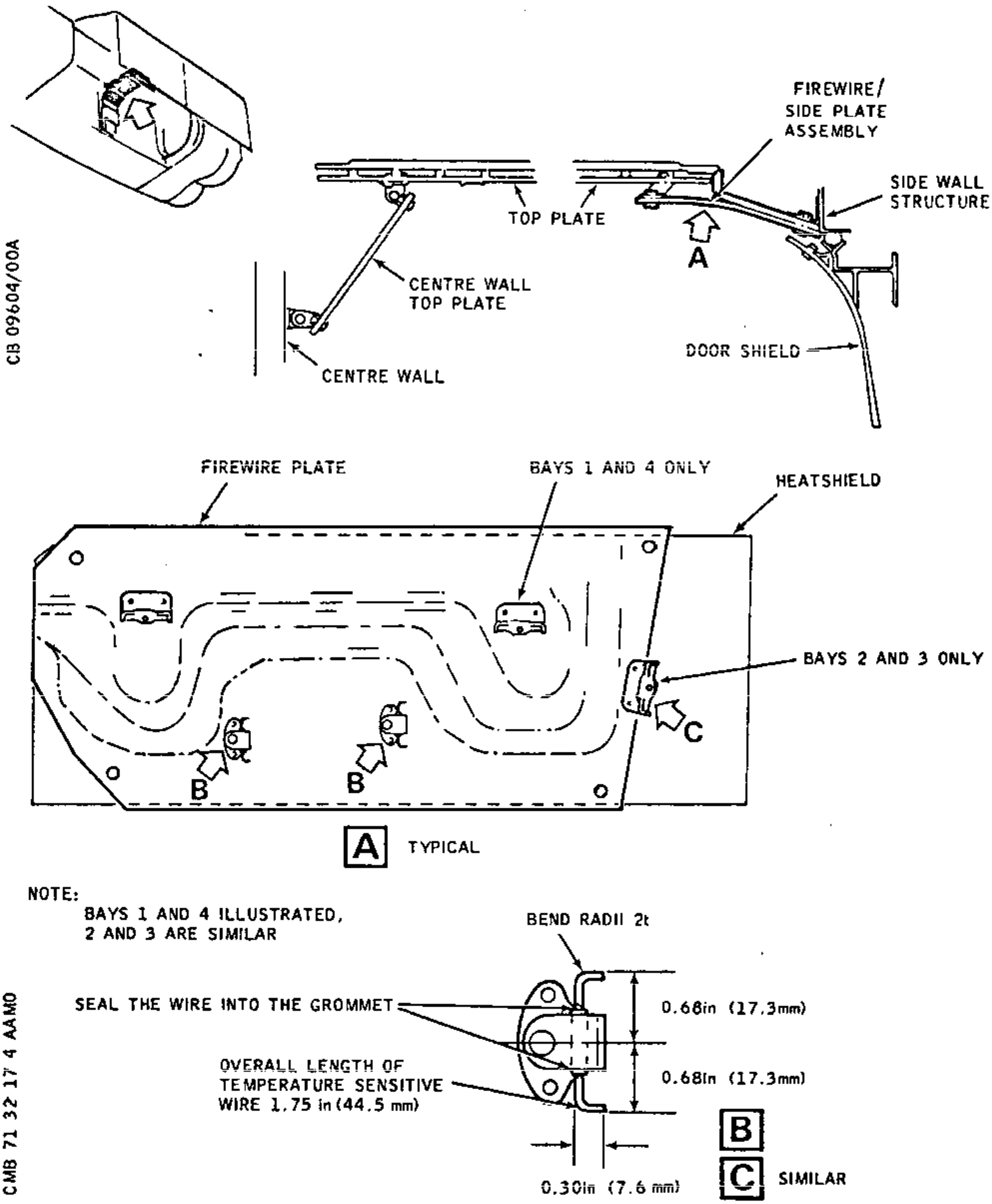
It is assumed that the engine bay doors are open, for inspection of the heatshields in accordance with 71.32.12 and 71.32.16

C. Remove

(1) Locate the sidewall firewire plates (Ref. Fig. 401)
(2) Remove the damaged wire, with the grommet, from the Camloc clamp.
(3) Remove all traces of the encapsulating compound.

D. Install

(1) Locate replacement wire into the grommet, bend the wire and seal with primer and sealant in accordance with Fig. 401.
(2) Fit the grommet into the Camloc clamp and lock the clamp.



Temperature Sensitive Wire - Installation
Figure 401

E. Conclusion

Recover in accordance with the relevant Maintenance Manual Topic.

ATTACH FITTINGS - DESCRIPTION AND OPERATION

1. General (Ref. Fig.001 and 002)

Attach fittings on or about the power unit are located either on the bottom surface of the wing, in the roof of the engine bay, or on the engine bay centre wall. Other brackets and fittings in the engine bay, and on the intake aft fireproof bulkhead are described in 54-40-00.

The roof brackets are attached to titanium stud plates bolted to the bottom surface of the wing. The studs protrude through the firewall (Ref.71-32-00) into the engine bay. A typical stud plate attachment is shown in the illustration (Ref. Fig. 001).

In the area of the engine bay roof, immediately forward of the heat exchangers the attach fittings are secured to studs that also protrude through, but do not secure, armour plate (Ref.71-00-14). The attach fittings on the engine bay centre wall include primary nozzle control (PNC) and thrust reverser aft (TRA) control supports, and reheat igniter transformer and flame detector supports on the rear panel. On the forward panel are mounted fire extinguisher system brackets, and, in bays No. 2 and 4 only, hydraulic system pipe and generator cable supports.

2. Air Conditioning Attach Fittings (Ref. Fig. 001)

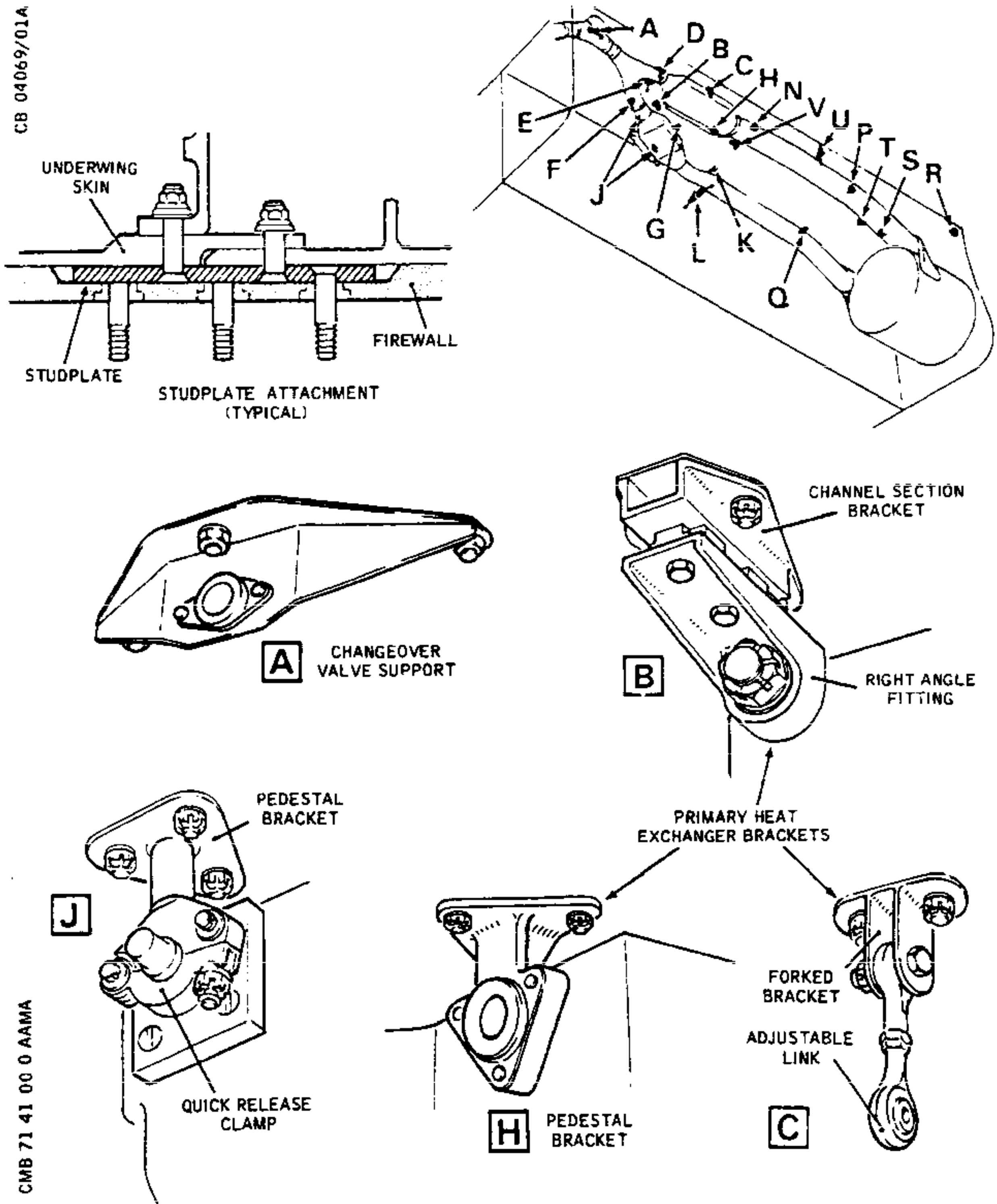
A. Primary Heat Exchanger

The primary heat exchanger is supported by three titanium suspension brackets, each bracket being secured to stud plates bolted to the undersurfaces of the wing.

Bracket (Detail C) is secured to two studs. Bolted between the bracket and heat exchanger is an adjustable link. The link consists of a male and a female steel rod end bearing assembly and a locknut. Both assemblies house self-lubricating spherical bearings.

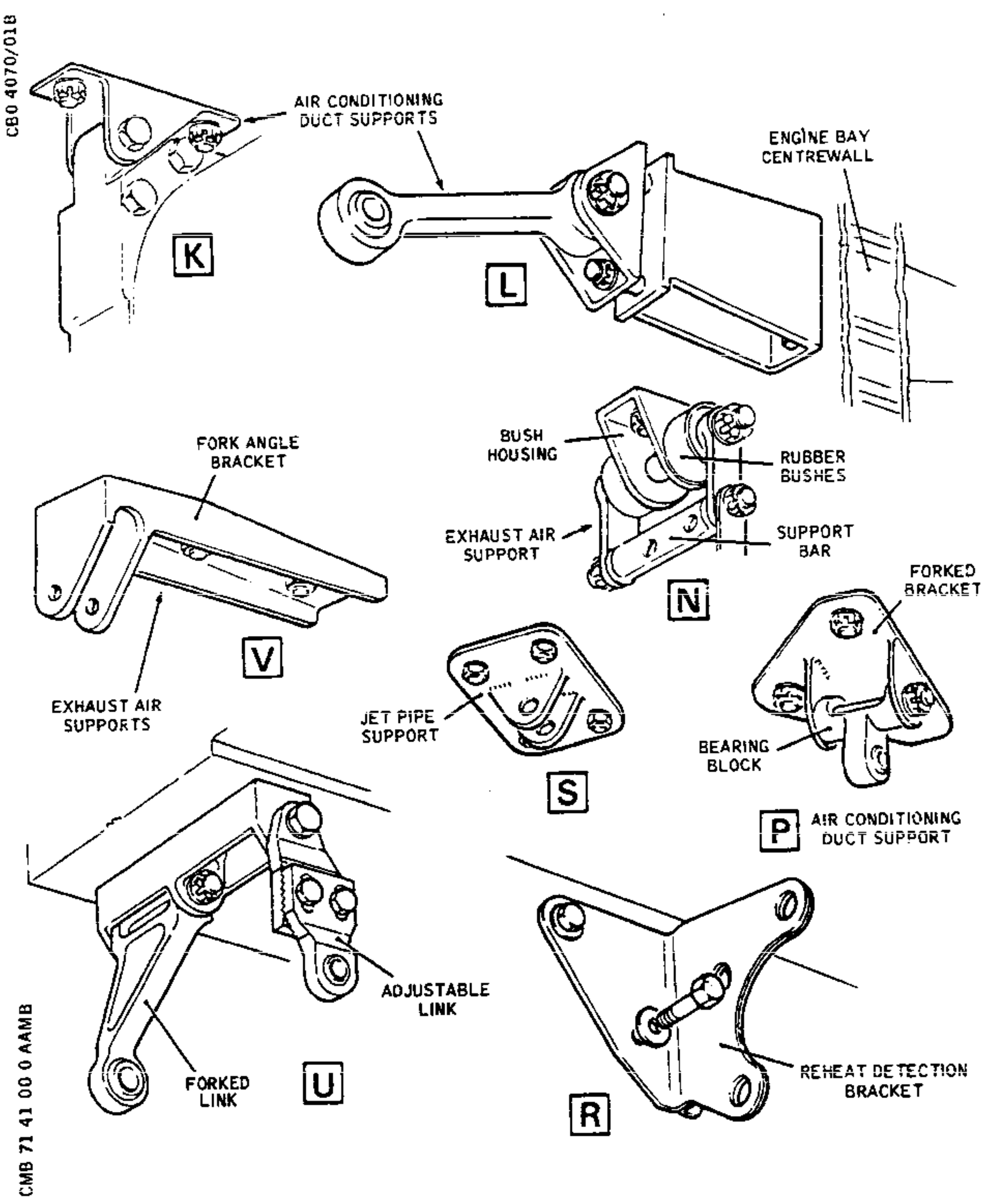
Bracket assembly (Detail B) is a channel section bracket housing two anchor nuts and a stop plate. The bracket is secured to three studs with a packer interposed between the bracket and the firewall during assembly. Secured to the channel bracket by two bolts is a right angle fitting of titanium.

Pedestal bracket (Detail H) incorporates a self-



- Engine Bay - Roof Fittings (Sheet 1 of 2)
Figure 001

R



- Engine Bay - Roof Fittings (Sheet 2 of 2)
Figure 001

R

lubricating spherical bearing. A packer is inserted between the bracket and the firewall during assembly.

B. Secondary Heat Exchanger

The secondary heat exchanger is supported by three titanium suspension brackets, each being secured to stud plates bolted to the undersurface of the wing. One is a fork bracket (Location G) to which is secured an adjustable link similar to that for attaching the primary heat exchanger shown in Detail C. The other two are pedestal brackets (Detail J) which incorporate a quick-release hinged clamp. A pivoted clamp bolt and captive nut permit the lower clamp half to hinge down for rapid removal of the heat exchanger.

C. Heat Exchanger Exhaust Air Duct

The duct support brackets are generally of titanium with some steel parts.

Bracket assembly (Location Q), similar to that shown at Detail P, consists of a forked bracket to which is bolted a steel bearing block housing a spherical ball in a projecting lug which is free to pivot.

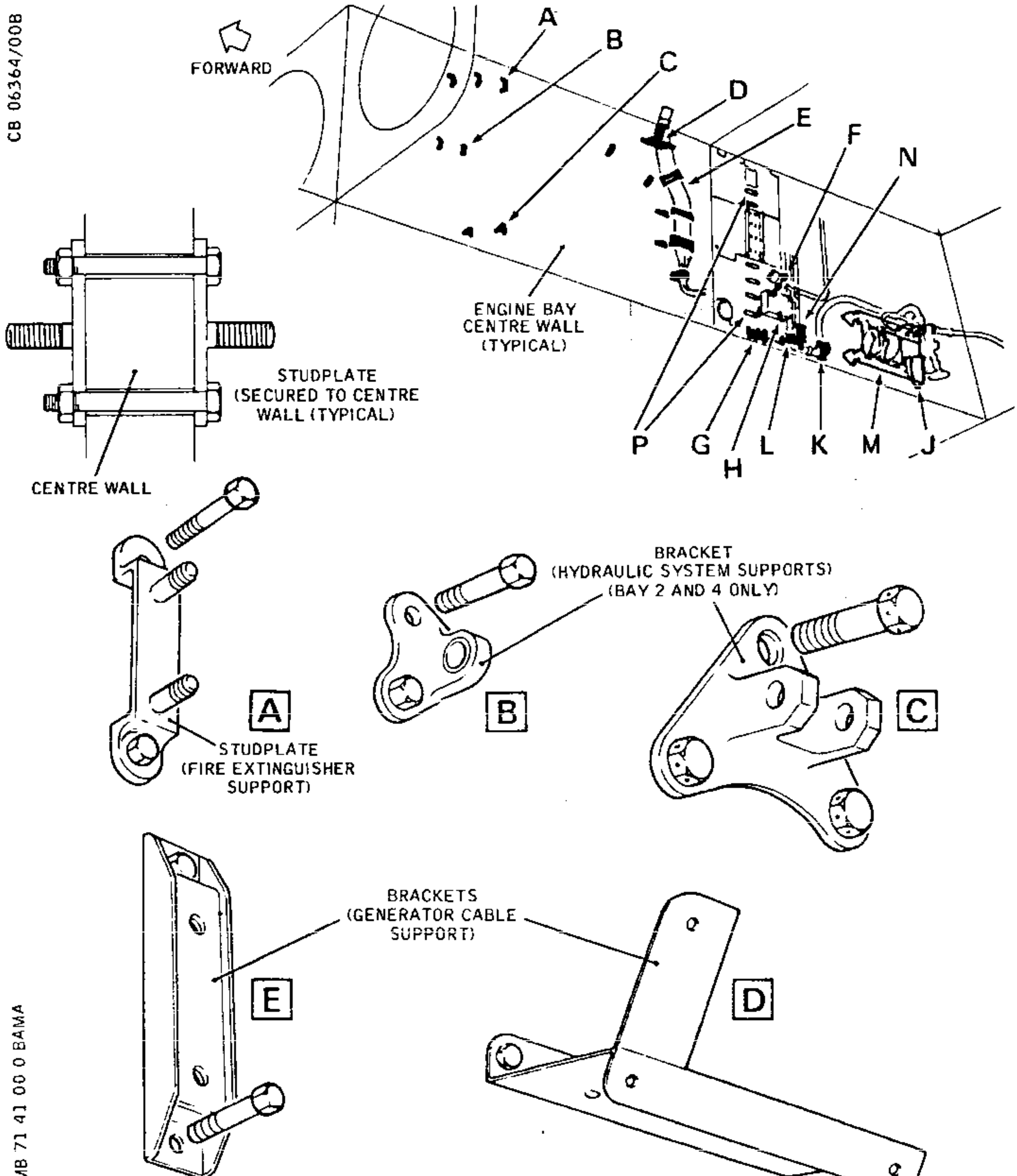
Pivoting lug fittings (Detail U) consists of a base bracket which is bolted to the longeron. Bolted to the bracket are a plain and a forked link. The links have spherical ball self-lubricating bearings at either end.

Bracket assembly (Detail N) consists of a bush housing incorporating a distance piece and two rubber bushes secured to a studplate. Bolted to the bush housing by two links is a support bar assembly which is free to swivel and houses two anchor nuts.

Bracket (Detail V) is a forked angle bracket secured to a studplate. The bracket is handed between engine bays and is bushed at the duct attachment points.

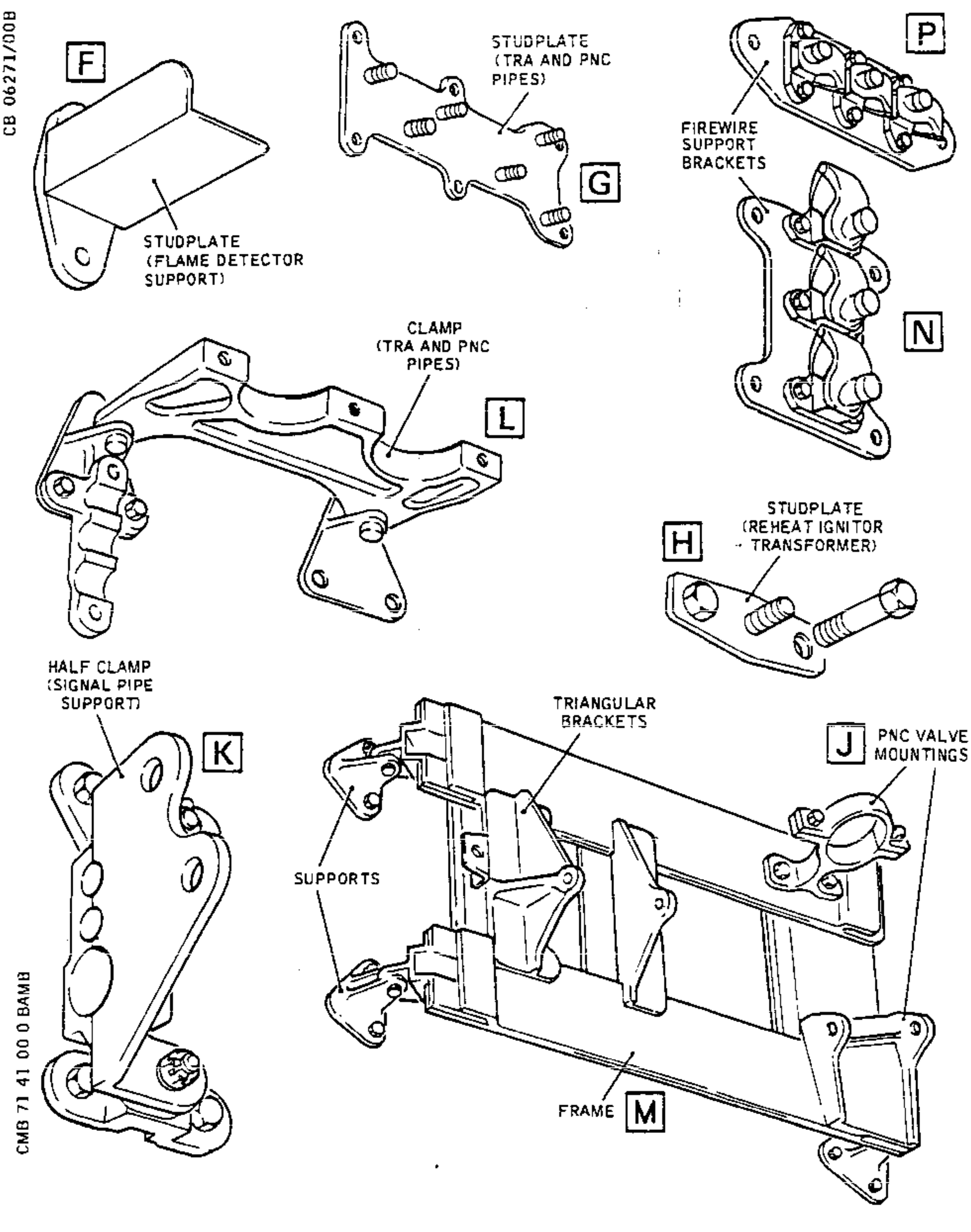
Bracket assemblies (Detail K and L) consists of a titanium bracket secured to a studplate, which supports the air conditioning duct and a titanium bracket bolted to the centre wall which provides a mounting for a fixed length link.

Bracket assembly (Detail P) consists of a forked bracket to which is bolted a bearing block housing a spherical ball in a projecting lug which is free to pivot.



- Engine Bay Centre Wall Fittings (Sheet 1 of 2)
Figure 002

R



- Engine Bay Centre Wall Fittings (Sheet 2 of 2)
Figure 002

R

D. Inlet Duct Supports

Fork-end fitting (Location D), which is similar to detail C, is manufactured from titanium and is attached to the longeron by two bolts. Bolted to the fork-end fitting is a fixed length link having a self-aligning bearing at each end.

Fork-end fitting (Location F) is similar to detail C but is secured to a studplate.

Fork-end fittings (Location E) is similar to that shown at detail C. The fitting is of titanium and is secured to a studplate. The fork carries an adjustable link.

E. Change-over Valve Support

A fabricated titanium bracket (Detail A) supports the change-over valve. The bracket accommodates a PTFE lined spherical bearing and is secured to a studplate at three points.

3. Jet Pipe Supports (Ref. Fig. 001)

Two titanium brackets (Detail S and Location T) are each bolted to a studplate secured to the bottom surface of the wing. The brackets are used in conjunction with special ground equipment, as an alternative to the jet pipe support trolley to support the jet pipe during maintenance.

4. Reheat Detection Bracket (Ref. Fig. 001)

A fabricated titanium bracket (Detail R) is bolted at three positions to the wing structure at the door hinge point. It supports the reheat detection switch.

5. PNC and TRA Supports (Ref. Fig. 002)

A. Nozzle Trim Unit Supports

A fabricated titanium frame (Detail M) supports the nozzle trim unit and PNC valve. The frame is raised from the engine bay centre wall on four feet. It consists of two parallel channel section longitudinal members braced by three vertical channel section members, the whole being welded and riveted as a complete assembly.

The frame is attached by four steel support brackets which are secured by bolts that pass through the centre wall in such a manner that the frame supports in No's 1 and 2 engine bays are secured by the same bolts. Lugs

at the extremities of the frame longitudinal members are bolted to the brackets.

Two steel triangular brackets are bolted to the forward and centre vertical members of the frame. These brackets form the mountings for the nozzle trim unit.

B. PNC Valve Supports

A steel fabricated clamp bracket bolted to the rear of the frame and a steel PNC fitting secured below it are the PNC valve mountings (Detail J).

C. PNC and TRA Control Air Pipe Supports

A titanium stud plate (Detail G), is secured to the rear panel of the centre wall by sleeved bolts. It supports the primary nozzle control and jet pipe pressure signal pipes.

A titanium clamp assembly (Detail L) supports the TRA and PNC supply pipes. It consists of two triangular brackets which are bolted to the centre wall. Bolted to a flange on each bracket is a half clamp mounting assembly to which is bolted a half clamp. The brackets and mounting assembly both incorporate nut plates.

A titanium half clamp (Detail K) supports the signal pipes. It is secured to the centre wall by sleeved bolts.

6. Reheat Igniter and Flame Detector Supports (Ref. Fig. 002)

R Studplates and brackets (Details H, F & N) are of titanium and
R (Detail P) of steel and are typical for the reheat igniter
R transformer and ultra violet flame detectors respectively.

7. Fire Extinguisher System Supports (Ref. Fig. 002)

Fire extinguisher supports consist of titanium studplates (Detail A) which are secured by bolts which pass through the centre wall.

8. Hydraulic System Supports - Bays 2 and 4 only (Ref. Fig. 002)

Hydraulic System Supports (Detail B) consist of right angle mounting brackets of titanium incorporating a bush. The brackets are secured by sleeved bolts which pass through the centre wall.

Other hydraulic system supports include triangular brackets of titanium (Detail C) which house a forked lug and are secured to the centre wall by three bolts.

9. Generator Conduit, Main Cable Supports - Bays 2 and 4 only (Ref. Fig. 002)

Generator conduit supports (Detail E) consist of a fabricated bracket assembly with two anchor nuts bolted through the centre wall. An additional fabricated bracket (Detail D) also supports the generator cables and is bolted to the centre wall.

ATTACH FITTINGS - REMOVAL/INSTALLATION

1. General (Ref. Figs. 401 and 402)

   Both primary and secondary heat exchangers are supported by three titanium suspension brackets, each bracket being secured to stud plates bolted to the undersurface of the wing.

2. Preparation

   Remove primary and secondary heat exchangers and respective exhaust ducts (Ref. 21-12-11 to 21-12-14, Removal/ Installation).

3. Removal

   A. Air Conditioning Ducts attach Fittings (Ref. Fig. 401)

      (1) Remove the two bolts and washers securing fork end fitting (Detail J) to the stud plate.

      (2) Remove fork end fitting (Detail J).

      (3) Remove the two nuts and washers from the securing studs on fork end fitting (Detail H).

      (4) Remove fork end fitting (Detail H), retain the tapered spacer.

      (5) Remove the two nuts and washers securing fork end fitting (Detail G).

      (6) Remove fork end fitting (Detail G) retain the tapered spacer.

   B. Primary Heat Exchanger Attach Fittings (Ref. Fig. 401)

      (1) Remove the two nuts and washers from the securing studs on forked bracket (Detail A).

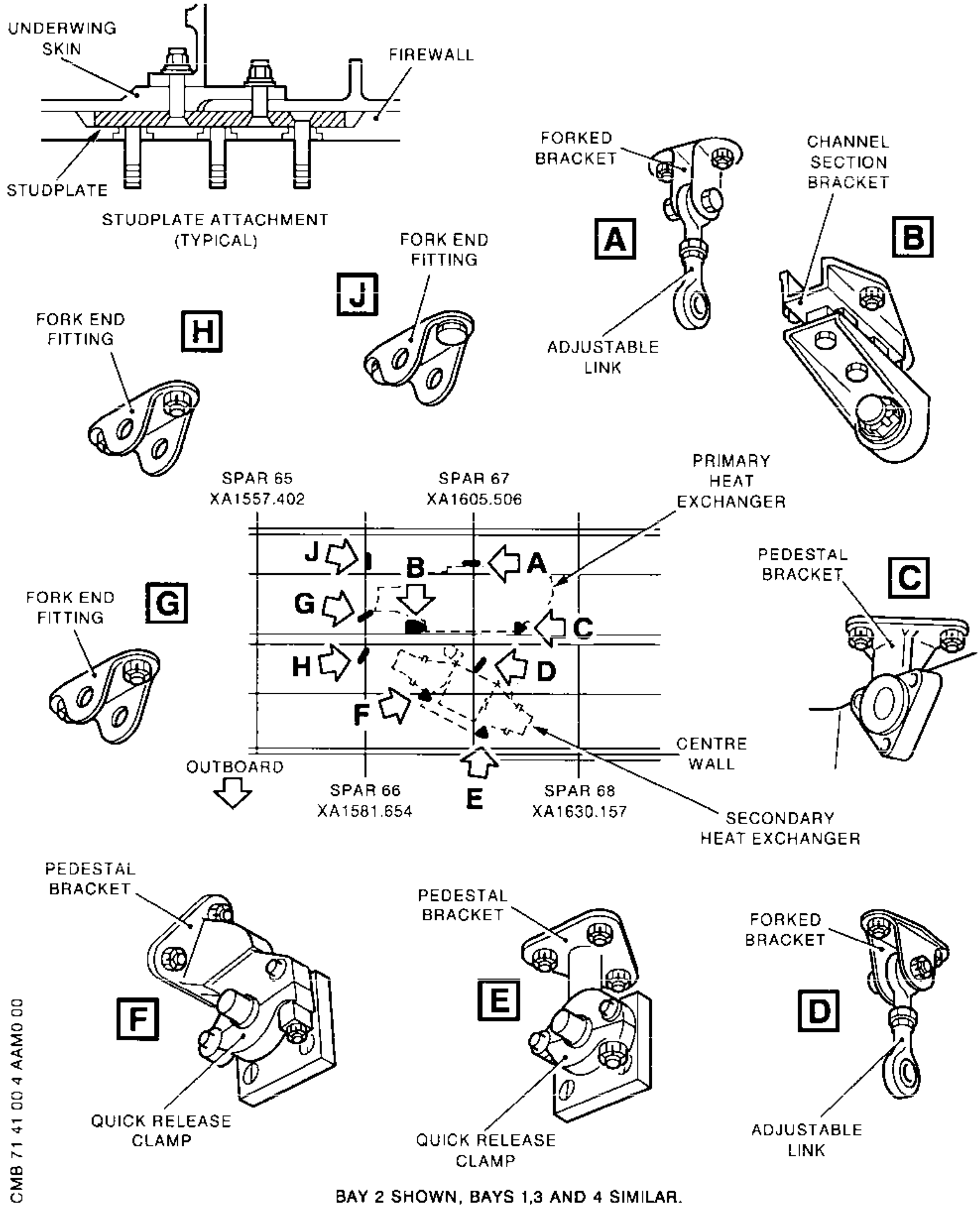
      (2) Remove forked bracket (Detail A).

      (3) Remove the three nuts and washers from the securing studs on channel section bracket (Detail B).

      (4) Remove channel section bracket (Detail B).

      (5) Remove the three nuts and washers from the securing studs on pedestal bracket (Detail C).

      (6) Remove pedestal bracket (Detail C).



Heat Exchanger Mounting Brackets
Figure 401

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C. Secondary Heat Exchanger Attach Fittings (Ref. Fig. 401)

(1) Remove the two nuts and washers from the securing studs on forked bracket (Detail D).

(2) Remove forked bracket (Detail D).

(3) Remove the three nuts and washers from each of the quick release clamp pedestal brackets (Details E and F) retain the packing washers.

(4) Remove both quick release clamp pedestal brackets (Details E and F).

D. Primary Heat Exchanger Exhaust Duct Attach Fittings (Ref. Fig. 402)

(1) Remove the two nuts and washers securing forked angle bracket (Detail A) to the stud plate.

(2) Remove forked angle bracket (Detail A).

(3) Remove the three nuts and washers securing the forked bracket (Detail B) to the stud plate

(4) Remove forked bracket (Detail B).

(5) Remove the two nuts and washers securing the bush housing bracket (Detail C) to the stud plate.

(6) Remove bush housing bracket (Detail C).

(7) Remove the locking wire, two nuts and bolts securing the pivot lug fitting (Detail D) to the longeron.

(8) Remove the pivot lug fitting (Detail D).

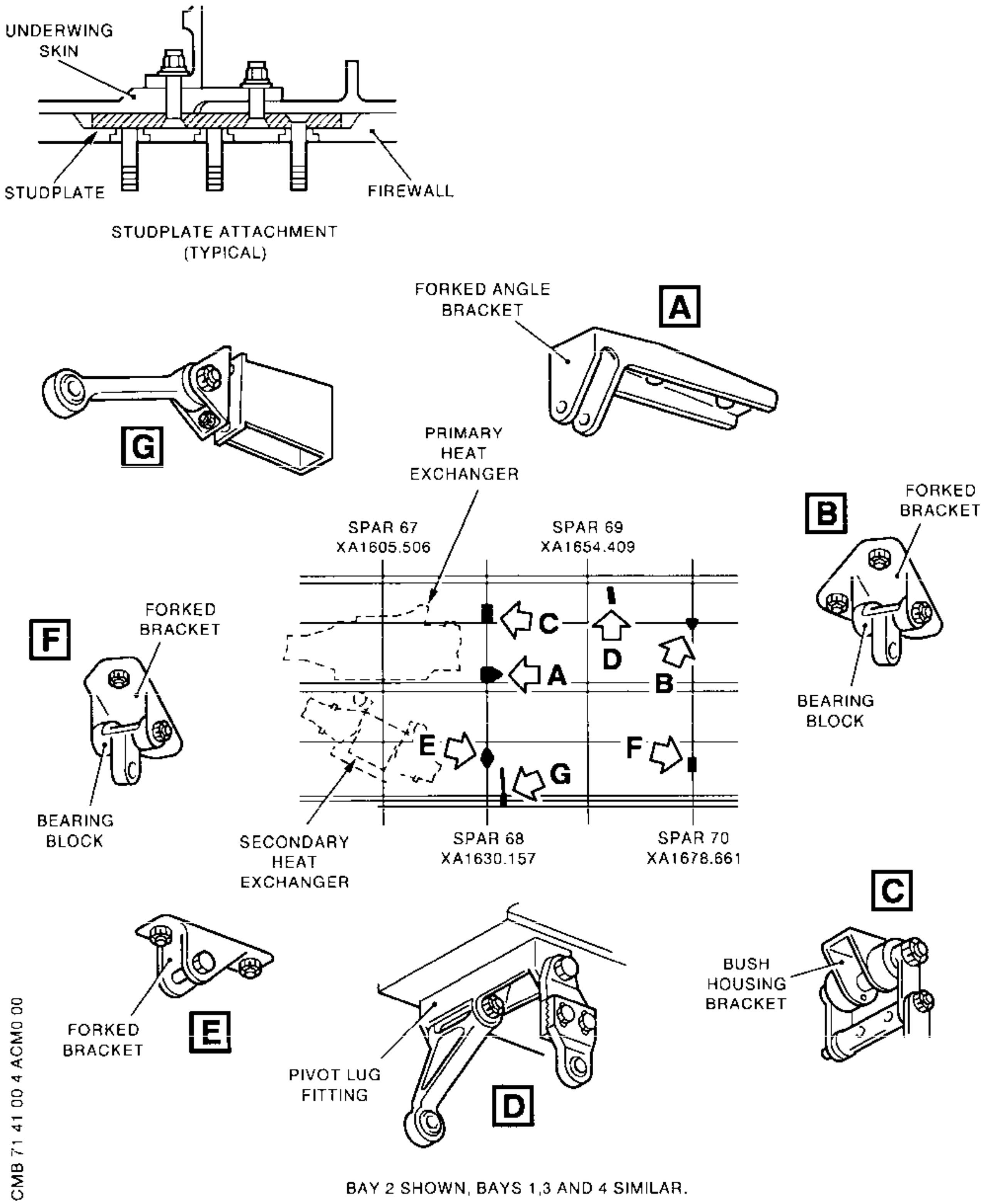
E. Secondary Heat Exchanger Exhaust Duct Attach Fittings (Ref. Fig. 402)

(1) Remove the two nuts and washers securing the forked bracket (Detail E) to the stud plate.

(2) Remove forked bracket (Detail E).

(3) Remove the nuts and washers securing forked bracket (Detail F) to the stud plate.

(4) Remove forked bracket (Detail F).



Heat Exchanger Exhaust Duct
Mounting Brackets
Figure 402

4. Installation

A. Air Conditioning Ducts Attach Fittings (Ref. Fig. 401)

(1) Secure fork end fitting (Detail J) in position with two bolts.

(2) Torque tighten the bolts to MP3.

(3) Position fork end fitting (Detail H) ensuring that the tapered spacer retained in para. 3.A.(4). above is fitted with the 45 deg cut corner to the front.

(4) Secure to stud plate with nuts and washers.

(5) Torque tighten the nuts to 60 to 70 lbf in (0.678 to 0.791 mdaN).

(6) Position fork end fitting (Detail G) ensuring that the tapered washer retained in para. 3.A.(6) above is fitted with the 45 deg cut corner to the front.

(7) Secure to stud plate with nuts and washers.

(8) Torque tighten the nuts to 60 to 70 lbf in (0.678 to 0.791 mdaN).

B. Primary Heat Exchanger Attach Fittings (Ref. Fig. 401)

(1) Position forked bracket (Detail A) onto the two securing studs and secure with nuts and washers.

(2) Torque tighten the nuts to 60 to 70 lbf in (0.678 to 0.791 mdaN).

(3) Fit channel section bracket (Detail B) onto the three securing studs and secure with nuts and washers.

(4) Torque tighten the nuts to 60 to 70 lbf in (0.678 to 0.791 mdaN).

(5) Position pedestal bracket (Detail C) onto the three studs and secure to the stud plate with washers and nuts.

(6) Torque tighten the nuts to 60 to 70 lbf in (0.678 to 0.791 mdaN).

C. Secondary Heat Exchanger Attach Fittings (Ref. Fig. 401)

(1) Position the forked bracket (Detail D) on to the two studs and secure with nuts and washers.

(2) Torque tighten the nuts to 60 to 70 lbf in (0.678 to 0.791 mdaN).

(3) Place pedestal bracket (Detail E) onto the three securing studs and secure with nuts and washers.

(4) Torque tighten the nuts to 60 to 70 lbf in (0.678 to 0.791 mdaN).

(5) Position pedestal bracket (Detail F) onto the three securing studs and secure with nuts and washers.

(6) Torque tighten the nuts to 60 to 70 lbf in (0.678 to 0.791 mdaN).

D. Primary Heat Exchange Exhaust Duct Attach Fittings (Ref. Fig. 402)

(1) Position forked angle bracket (Detail A) onto the two security studs and secure with nuts and washers.

(2) Torque tighten the nuts to 60 to 70 lbf in (0.678 to 0.791 mdaN).

(3) Place forked bracket (Detail B) onto the three securing studs and secure with nuts and washers.

(4) Torque tighten the nuts to 60 to 70 lbf in (0.678 to 0.791 mdaN).

(5) Position bush housing bracket (Detail C) to the two studs and secure with nuts and washers.

(6) Torque tighten the nuts to 60 to 70 lbf in (0.678 to 0.791 mdaN).

(7) Position the pivot lug fitting (Detail D) secure with nuts and washers.

(8) Torque tighten the bolts to 200 to 220 lbf in (2.26 to 2.486 mdaN).

(9) Wire lock the bolts to MP13.

E. Secondary Heat Exchanger Exhaust Duct Attach Fittings (Ref. Fig. 402)

(1) Position forked bracket (Detail E) onto two securing studs and secure with nuts and washers.

(2) Torque tighten nuts to 60 to 70 lbf in (0.678 to 0.791 mdaN).

(3) Position forked bracket (Detail F) onto the two secondary studs and secure with nuts and washers.

(4) Torque tighten nuts to 60 to 70lbf in (0.678 to 0.791 mdaN).

PNC AND PNT UNITS MOUNTING FRAME - INSPECTION/CHECK

1. General

A visual examination of the primary nozzle control (PNC) and primary nozzle trim (PNT) mounting frame assembly must be performed when the PNC or PNT units are removed, at each engine change and during zonal inspection of the engine bays.

2. Mounting Frame Assembly

A. Equipment and Materials

DESCRIPTION	PART NO.
Cleaning Solvent, BACM 302 (Ref.20-30-00, No.473)	-
Kimwipe tissues	-

B. Prepare to Remove Mounting Frame

(1) If necessary, remove PNC and PNT units. (Ref.76-13-11 and 76-13-12).

(2) Remove mounting frame from engine bay centrewall (Ref.76-13-21).

C. Examine Mounting Frame

(1) Clean the mounting frame and centrewall attachment brackets with a clean tissue moistened with solvent.

(2) Check the forward and rear attachment brackets, frame and bolts for wear as follows:

(a) 0.25 in (6.44 mm) diameter bolt and hole; cumulative wear limit not to exceed 0.020 in (0.5 mm).

(b) 0.312 in (8 mm) diameter bolt and hole; cumulative wear limit not to exceed 0.030 in (0.75 mm).

(3) Carry out a close visual check for cracks and damage.

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(4) Cracks are unacceptable. If cracks exist or damage exceeds (2) above, replace the component or refer to 71-41-11 Approved Repairs.

D. Install Mounting Frame

(1) Refit mounting frame to engine bay centrewall. (Ref.76-13-21).

(2) Refit PNC and PNT units (Ref.76-13-11 and 76-13-12).

E. Conclusion

(1) Close engine bay doors (Ref.71-00-00 Servicing).

PNC AND PNT UNITS MOUNTING FRAME - APPROVED REPAIRS

1. General

These weld repairs are for implementation when found necessary by the inspections given in 71-41-11, Inspection/Check.

2. Mounting Frame Assembly

A. Equipment and Materials

DESCRIPTION	PART NO.
Cleaning Solvent, BACM 302, (Ref.20-30-00, No.473)	-
Kimwipe tissues	-

B. Preparation

(1) Clean the mounting frame and centrewall attachment brackets with a clean tissue moistened with solvent.

C. Repair to Mounting Frame

(1) Repair cracks by welding in accordance with 20-26-41.

D. Repair to Mounting Frame Brackets (Ref.Fig.801)

(1) Repair worn bolt holes (plain and slotted), by welding in accordance with 20-26-41.

(2) Drill new holes 0.25 in (6.44 mm) or 0.312 in (7.9 mm) diameter as appropriate.

E. Repair to Centrewall Attachment Brackets (Ref.Fig.801).

(1) Repair worn bolt holes (plain and slotted), by welding in accordance with 20-26-41.

(2) Drill new holes 0.25 in (6.44 mm) or 0.312 in (7.9 mm) diameter as appropriate.

(3) Drill and slot three new holes 0.190 in (4.8 mm) diameter as appropriate.

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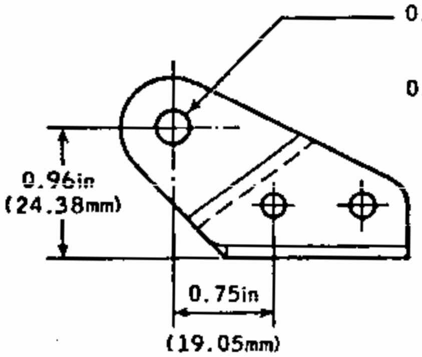
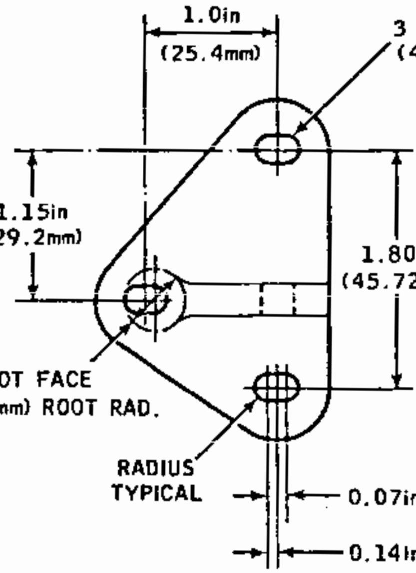


FRAME ATTACHMENT BRACKETS
(TYPICAL)



CENTRE WALL ATTACHMENT BRACKETS
(TYPICAL)

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PNC and PNT Mounting Frame
Centrewall Attachment Brackets
Figure 801

ENGINE ELECTRICAL HARNESS - DESCRIPTION AND OPERATION

1. General (Ref. Fig.001)

The electrical harness comprises seven multi-cable looms which connect the engine components to the aircraft systems at a common disconnect point. The receptacles for the harness plugs are mounted on a disconnect box located on the left-hand side of engine bays 1 and 3 and on the right-hand side of bays 2 and 4.

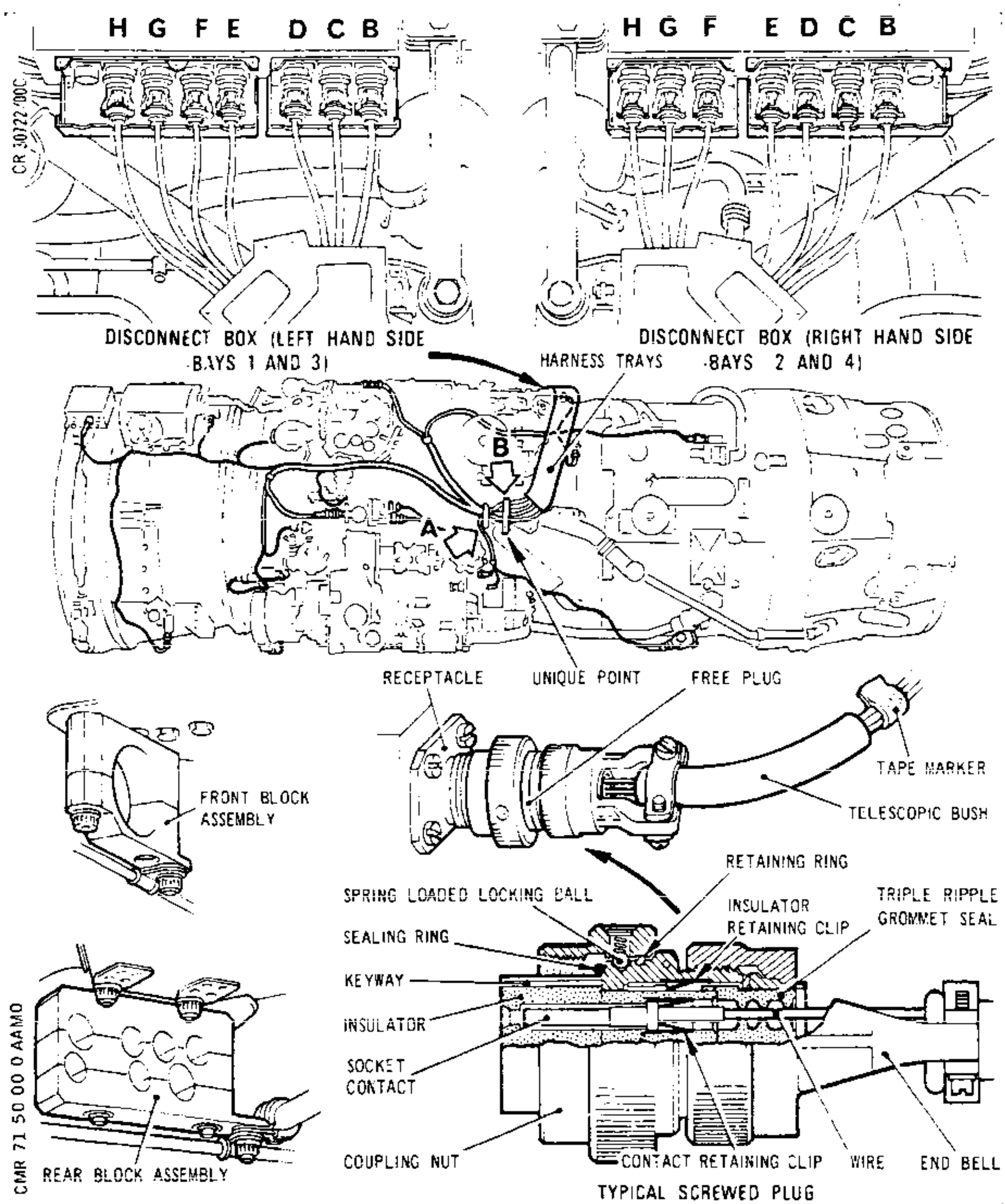
A harness support bracket, the unique point, located centrally beneath the engine enables the harness to be routed left or right to the disconnect point.

2. Description

Lengths of cable, assembled to screw type plugs, are grouped together to form the looms of the harness assembly. The individual cables are secured along the length of the looms by lacing and spiral binding where necessary. Whipping is used at loom junctions and to mark the position of loop clamps and the unique point blocks.

A tray, support bracket and block assemblies located centrally under the engine form the unique point. The tray assembly and support bracket assembly are bolted together and secured to engine mounted brackets. The two block assemblies are secured to the tray assembly and provide for the clamping of the harness looms. The top and bottom blocks of the front block assembly clamp the looms together in a group while the three blocks of the rear assembly clamp the seven looms separately. The harness trays are bolted to the support bracket assembly of the unique point and run either left or right toward the disconnect box. The seven looms are routed side by side in the trays from the disconnect box to the unique point from where they extend to their respective components. The looms are retained in the trays by the pressure of the tray covers and, from the unique point to the engine components, are secured to the engine by loop clamps.

Straight screwed type plugs, Cannon HTMA on HTMAS and Compagnie Deutsch 992, effect the connection of the cables to the receptacles at the disconnect point and engine components. The steel plugs are
R sealed by a peripheral seal and wire sealing integral grommets. Each plug has a self-locking coupling nut and a keyway, alternative keyway positions are used to differentiate between adjacent plugs of similar connection. Various sizes of receptacle and plug are provided, the largest size accommodating up to 37 pin or socket contacts located



Electrical Harness - Installed
Figure 001

R

in glass reinforced silicone moulded insulators. A contact is assembled to each hole location in the insulator and is held in place by the spring tines of a retaining clip secured in each location. Sealing plugs are inserted in the rear of unwired contacts to seal the holes.

Identification of the looms is effected by tape markers secured to the looms. Three markers secured on each loom, close to the disconnect plug, identify the loom by serial number, part number and letter. The letter marker will identify the loom with the letter of the receptacle on the disconnect box, similar letter markers are secured at intervals on the loom from the disconnect plug to the unique point. Loom terminals for the engine services are identified by a letter/number marker, the letter identifies the loom with the disconnect plug and the number identifies the engine service. The plugs on the harness are given identification markings to aid installation. The harness is shown in its installed position, disconnect box flame shield covers removed, in the illustration (Ref.Fig.001) and schematically in the illustration
R (Ref.Figs.002 and 003). The plugs and their services are stated in paragraph 3. Different size plugs aid in ensuring correct connection, an additional safeguard where similar plugs are located in the same area is the use of plugs with dissimilar keyway settings.

R 3. Harness Plugs and Services (Ref. Fig.004)

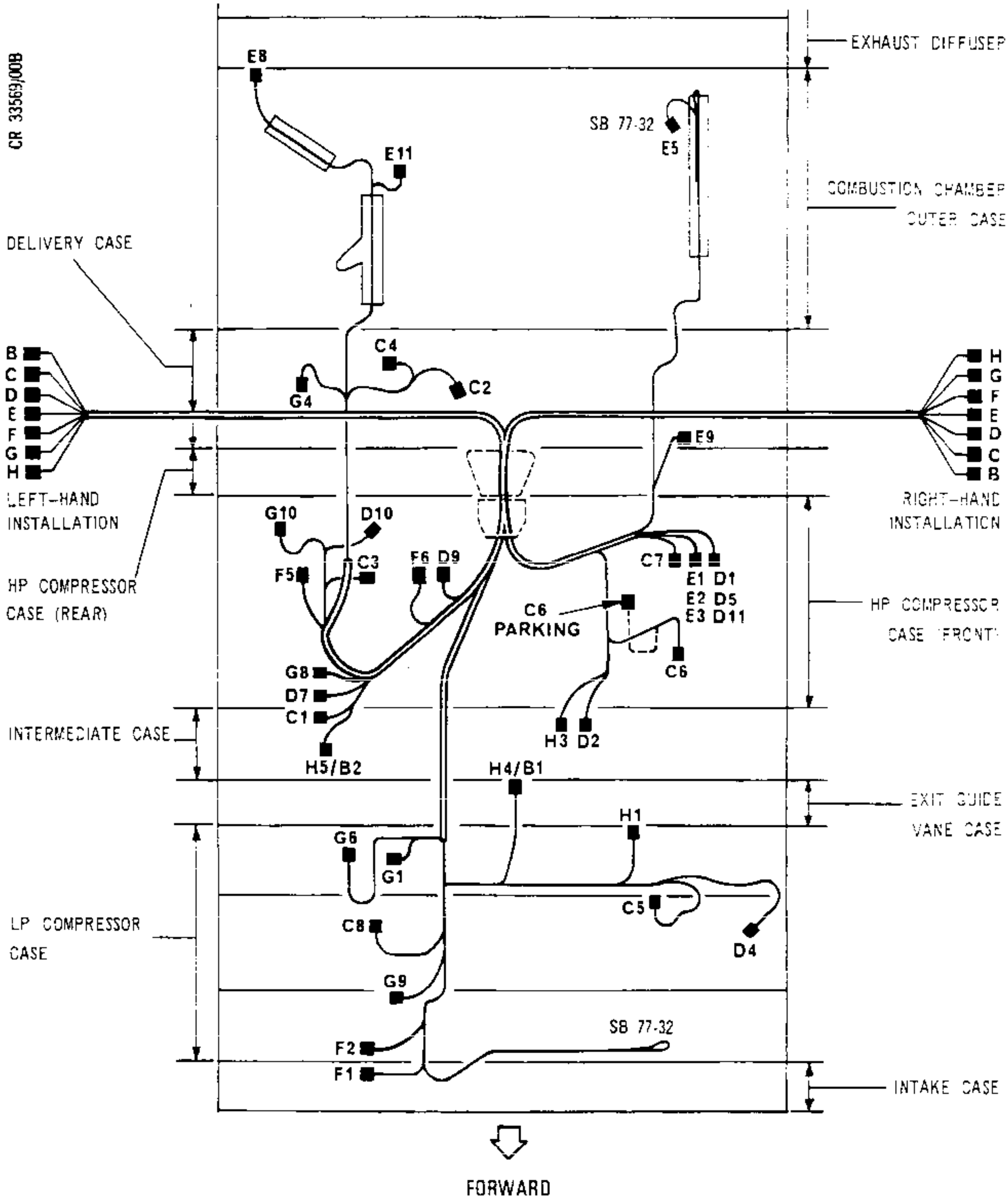
Services Supplied by Disconnect Box Plug B:

HP Compressor RPM Probe (N_2 Speed Probe)(4 circuits) B.2
LP Compressor RPM Probe (N_1 Speed Probe)(4 circuits) B.1

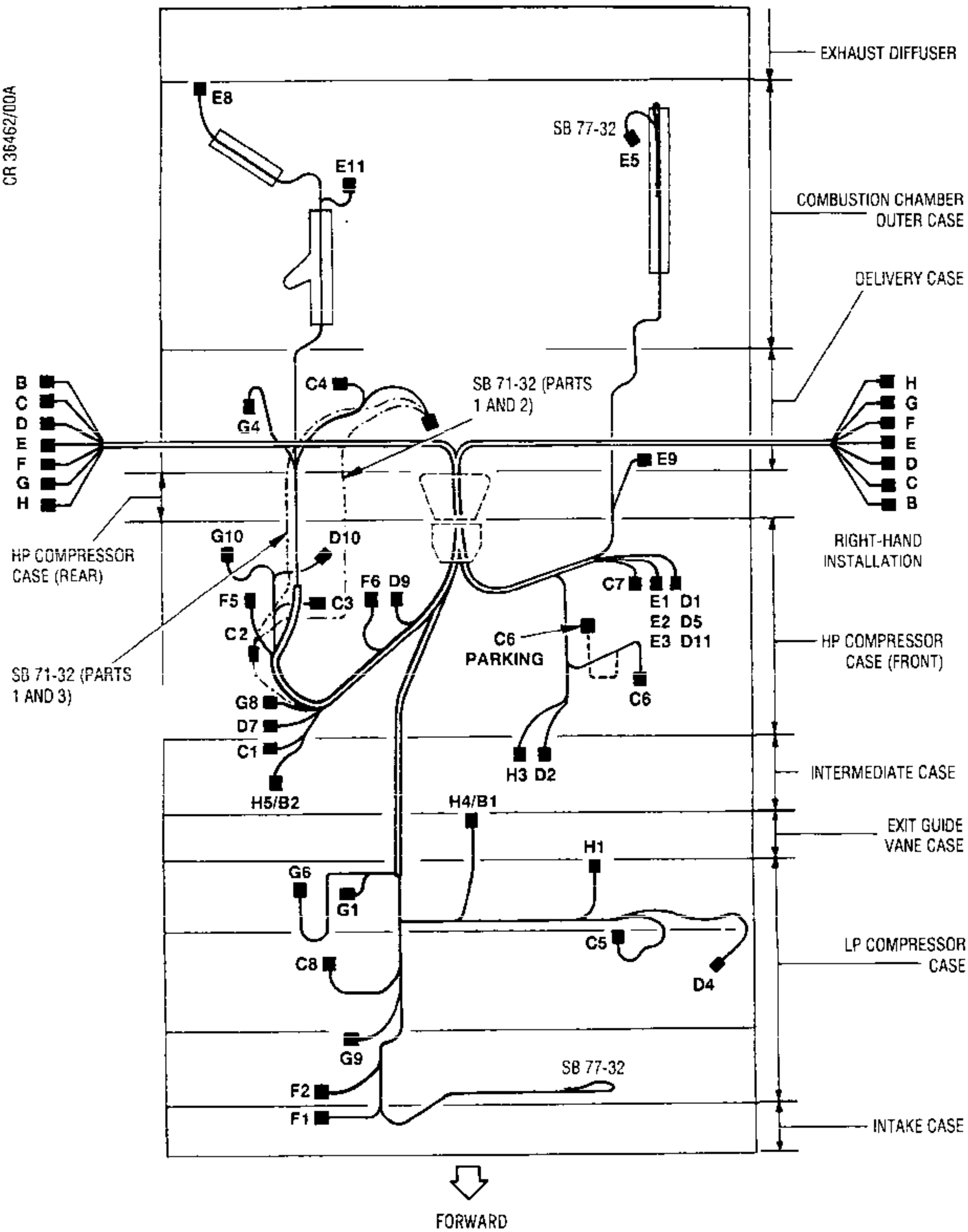
Services Supplied by Disconnect Box Plug C:

Reheat Controller Shut-off Valve Solenoid (Reheat Fuel Valve) C.3
Hydraulic Pump Off Load Valve (Alt) C.6
Fuel Differential Pressure Warning Switch (Fuel Filter Diff. Press. Switch) C.8
Electric Starter Pump (Engine Fuel Starting Pump) C.7
Reheat Purge Valve Position Transducer (Reheat Purge Valve Position) C.4
Engine Anti-icing Air Pressure Switch C.5
Reheat Controller Motor (Reheat Actuator) C.2
Throttle Actuator Gearbox (Main) C.1

Services Supplied by Disconnect Box Plug D:



R Electrical Harness Plug Locations
(Pre SB OL593-71-8998-32)
Figure 002



R Electrical Harness Plug Connections
R (SB OL593-71-8998-32)
R Figure 003

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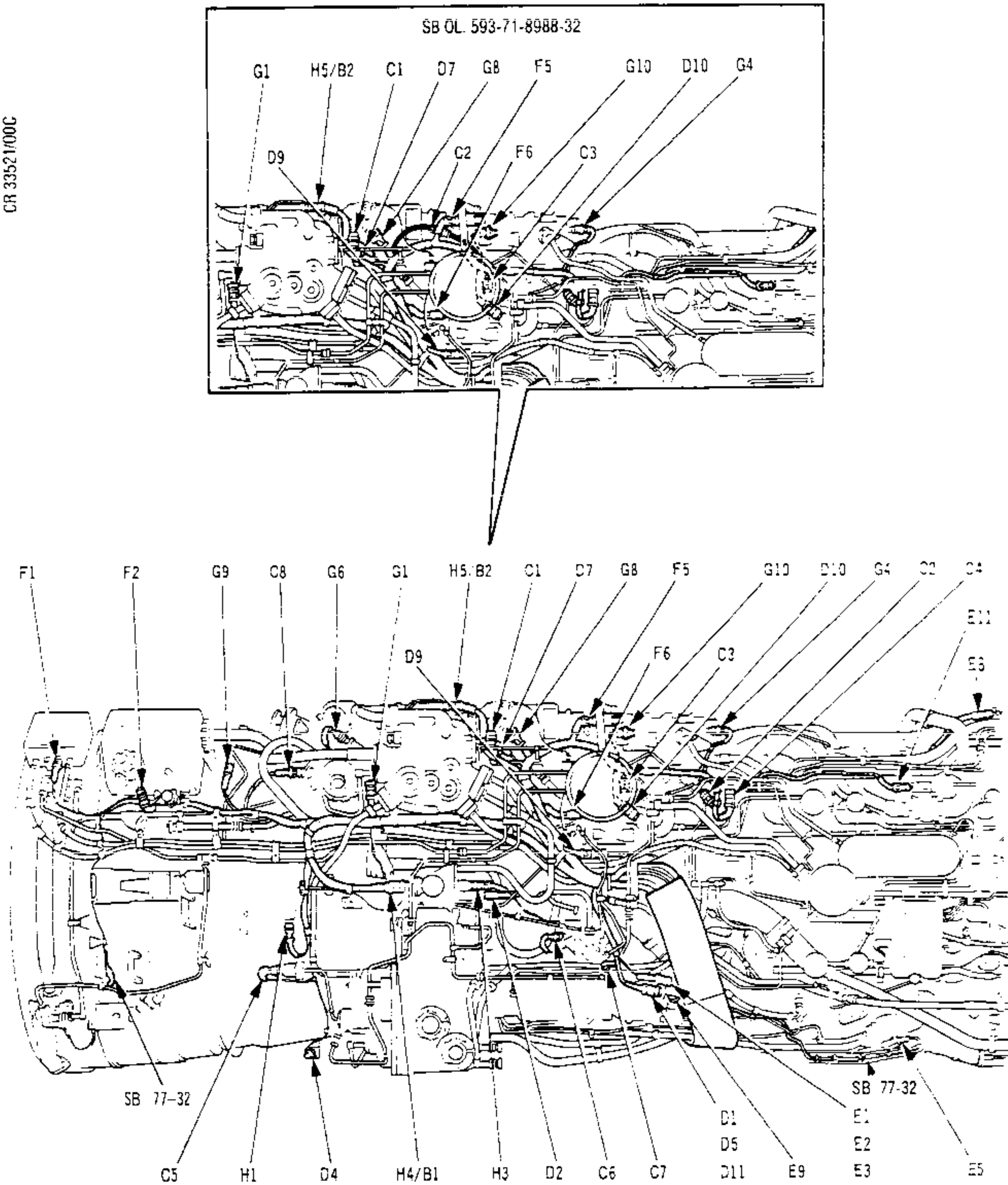


VIEW ON UNDERSIDE OF ENGINE

Electrical Harness and Plug Locations
Figure 004

R

N_1 Governor Valve D.7
IDG Mag. Trim D.1
Engine Oil Pressure Transmitter D.2
HP Turbine Bearing Oil Inlet Thermometer D.10
HP Turbine Bearing Oil Drain Thermometer D.9
IDG Oil Low Pressure Switch D.5
Air Starter Valve D.4
IDG Speed Probe D.11

Services Supplied By Disconnect Plug E:

Reheat Purge Valve E.9
Engine Anti-icing Air Pressure Control Valve (Solenoid Valve) E.5
IDG Disconnect Solenoid E.1
Engine Fuel Heater Control Valve (Solenoid Valve) E.11
IDG Oil Inlet Thermometer E.2
IDG Oil Outlet Thermometer E.3
Reheat Flame Detector E.8

Services Supplied by Disconnect Box Plug F:

Oil Tank Contents Transmitter and Overfill Switch (Engine Oil Tank Quantity and Overfull Warning) F.2
Engine Fuel Flowmeter (Main Engine Flowmeter) F.5
Reheat Fuel Flowmeter (Reheat Flowmeter) F.6
Engine Ignition F.1

Services Supplied by Disconnect Box Plug G:

HP Valve Position Indicator G.10
Engine Fuel Recirculation Valve G.9
Fuel Heater Control Thermometer (Fuel Filter Inlet Temp.) G.1
Fuel Nozzle Inlet Thermometer (Sprayer Fuel Inlet Temp.) G.4
Engine Oil Inlet Thermometer (Engine Oil Temp.) G.6
Throttle Actuator Gearbox (Alt) G.8

Services Supplied by Disconnect Box Plug H:

Hydraulic Pump Off Load Valve (Main) H.1
HP Compressor RPM Probe (N_2 Speed Probe)(1 circuit) H.5
LP Compressor RPM Probe (N_1 Speed Probe)(3 circuits) H.4
Engine Oil Low Pressure Switch H.3

ENGINE ELECTRICAL HARNESS - REMOVAL/INSTALLATION

1. General

This chapter contains the procedure for the disassembly and assembly of electrical harness plugs and lead ends at the disconnect box and engine components that is required for the removal of parts.

On engines to S.B.OL.593-71-15 and 71-8455-23 standard, the electrical lead end plugs will be identified by the manufacturers code prefix HTMAS for Cannon and 992 for Deutsch. Pre-S.B.OL.593-71-15 and 71-8455-23 plugs are identified by the code prefix HTMA.

R For the procedure to clean electrical connectors refer to
R Chapter 70-00-11 Standard Practices.

2. Tools and Equipment

Contact insert/extract tool (Cannon) ... ... NAS 1664-16

3. Approved Materials

Glasscloth tape 1.0 in (25 mm) wide:

	Permacel P.212	0.0075 in (0,19 mm) thick
	or	
	Scotch Type 69	0.0060 in (0,15 mm) thick
	or	
	Tygaflor 128/10T	0.0098 in (0,25 mm) thick
Locking wire	DTD 189A (OMat 2/97)	0.0197 in (0,5 mm) diameter
	or	
	DTD 189A (OMat 2/125)	0.0315 in (0,8 mm) diameter

4. Disassemble and Assemble Plug to Lead End (Ref. Fig.401 and 402)

A. Remove Plug from Lead.

(1) Remove lockwire securing two screws to plug end bell.

(2) Remove lockwire securing plug end bell to plug body.

(3) Remove screws and flat washers (Cannon plugs only) securing clamp bars to plug end bell. Remove two half clamps or half bushing sleeves, or slide telescopic bush(es) or bush and cable spacers clear of plug, whichever is appropriate.

(4) Unscrew plug end bell from plug body and slide clear of plug.

(5) Note the contact locations in plug and carefully withdraw contacts from plug body using insert/ extract tool.

(6) Remove plug end bell from lead and retain removed items that are to be re-used.

B. Assemble Plug End with Telescopic Bush (Ref.Fig.403) (detail A).

(1) With end bell assembled to lead, identify contact to be installed with its location in the plug by reference to Wiring Diagram Manual and verify with noted positions.

(2) Insert core into insert tool.

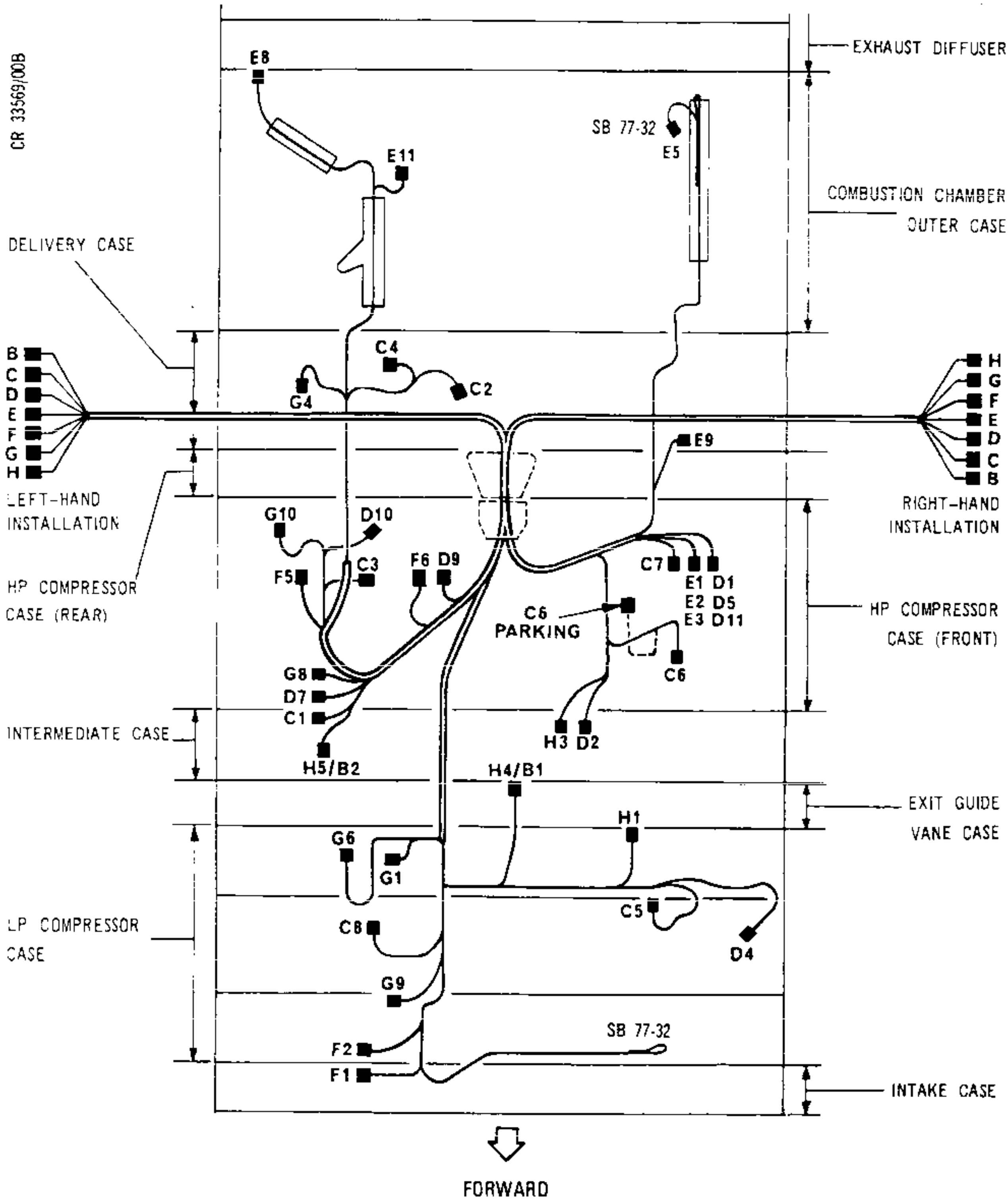
(3) Using firm even pressure, press tool against contact shoulder and insert contact and tool into insulator until retaining tines can snap into place behind contact shoulder when tool is withdrawn.

(4) Withdraw tool from insulator, lightly pull core to ensure contact is properly seated and positively retained by the tines.

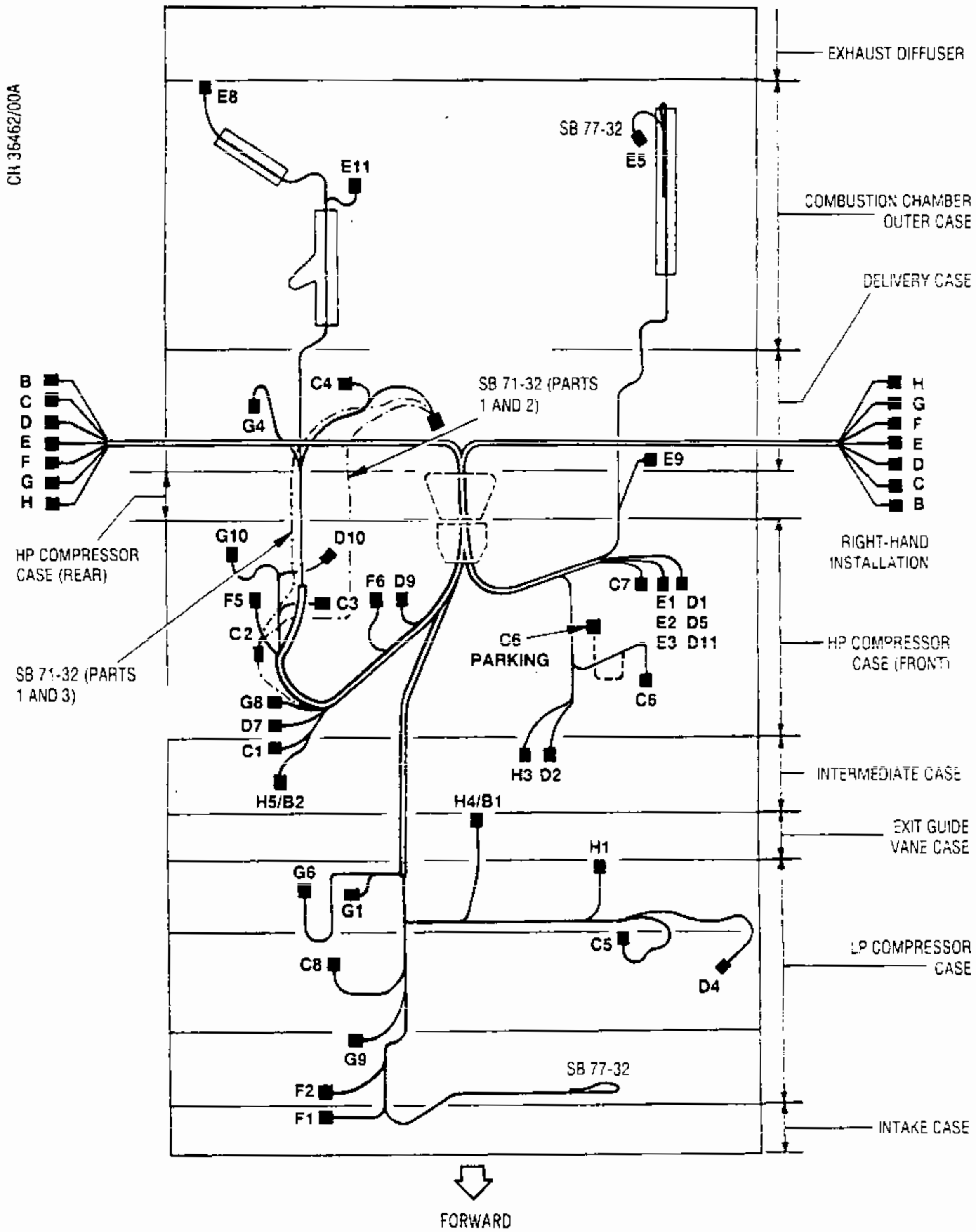
(5) Proceed to insert remainder of contacts in their respective positions in the insulator and seal any unused contact positions with sealing plugs. When contacts are inserted, assemble plug end bell to plug body and hand-tighten.

(6) Slide telescopic bush(es) into position on lead and secure with clamp bar(s), screws and (Cannon plugs only) flat washers.

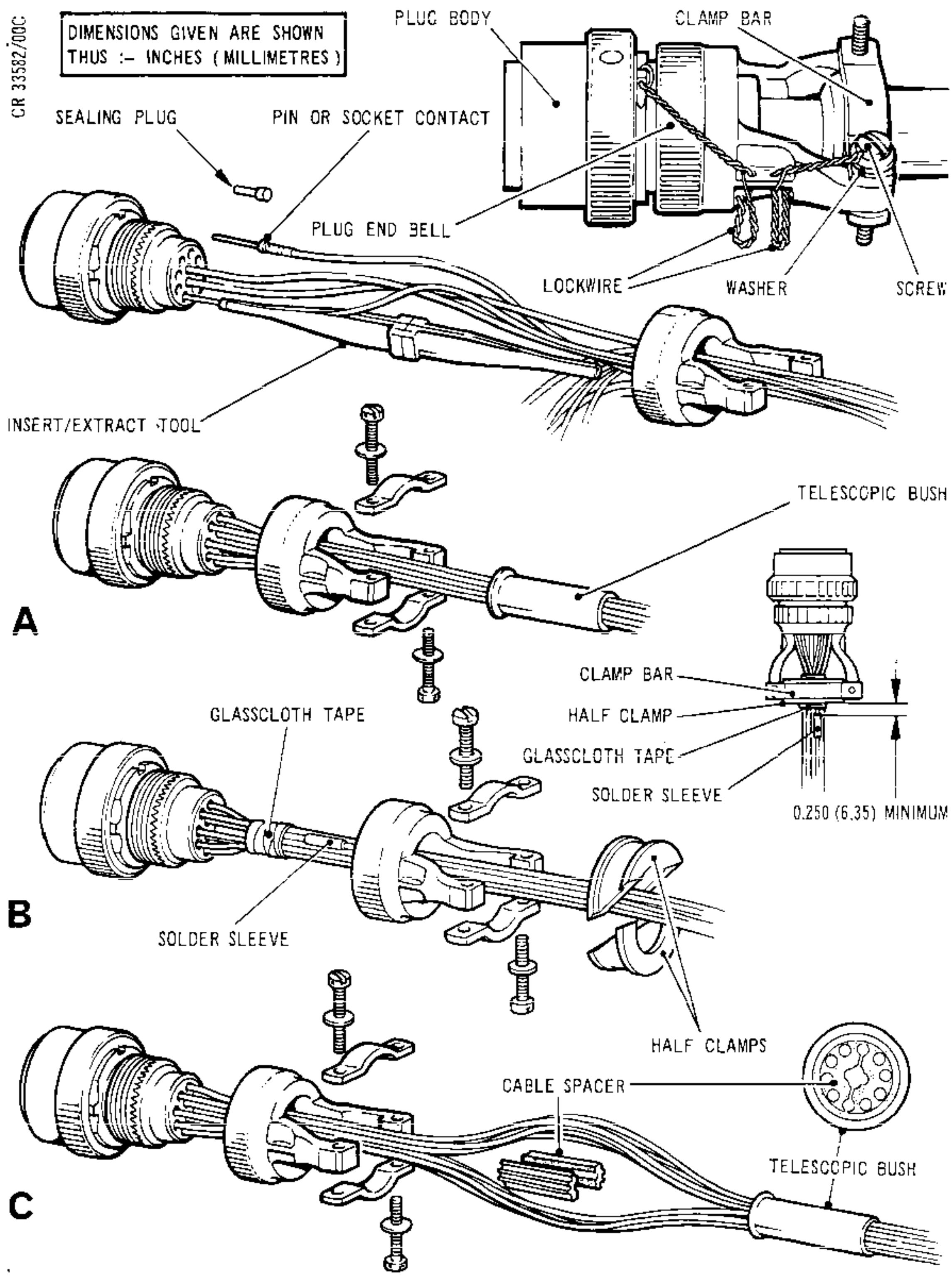
(7) On engines to pre-S.B.OL.593-71-15 and 71-8455-23 standard (Ref.Fig.401, 402 and 403), at positions other than disconnect points B to H (Ref.para.C.), evenly tighten the clamp bar screws until the telescopic bush(es) are firmly gripped and there is no gap between clamp bars.



R Electrical Harness and Plug Connections (Pre SB OL593-71-8988-32)
Figure 401



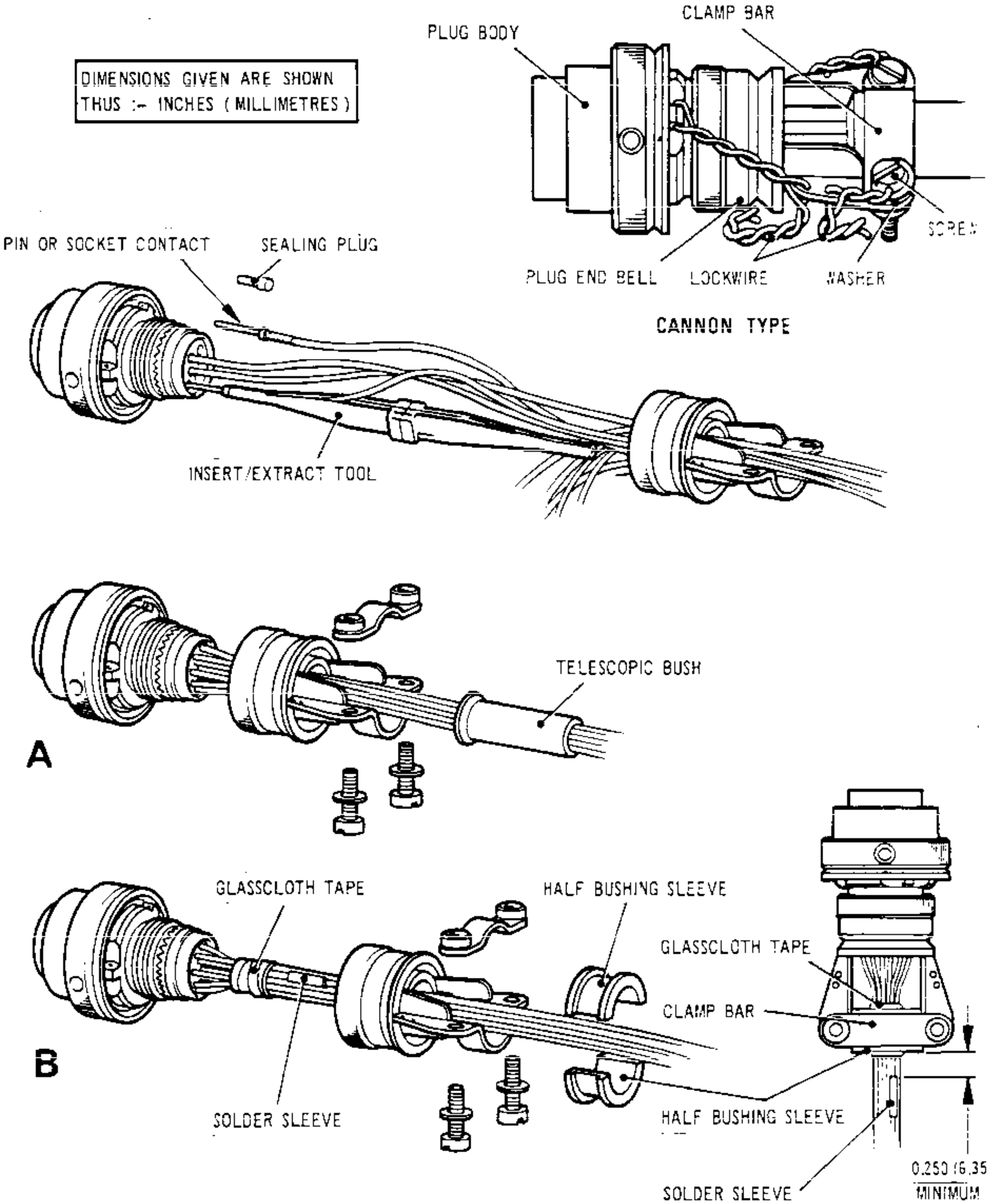
R Electrical Harness and Plug Connections (SB OL593-71-8988-32)
R Figure 402



Plug Assembly Detail (Pre S.B.OL.593-71-15
and 71-8455-23) (Sheet 1 of 3)
R Figure 403

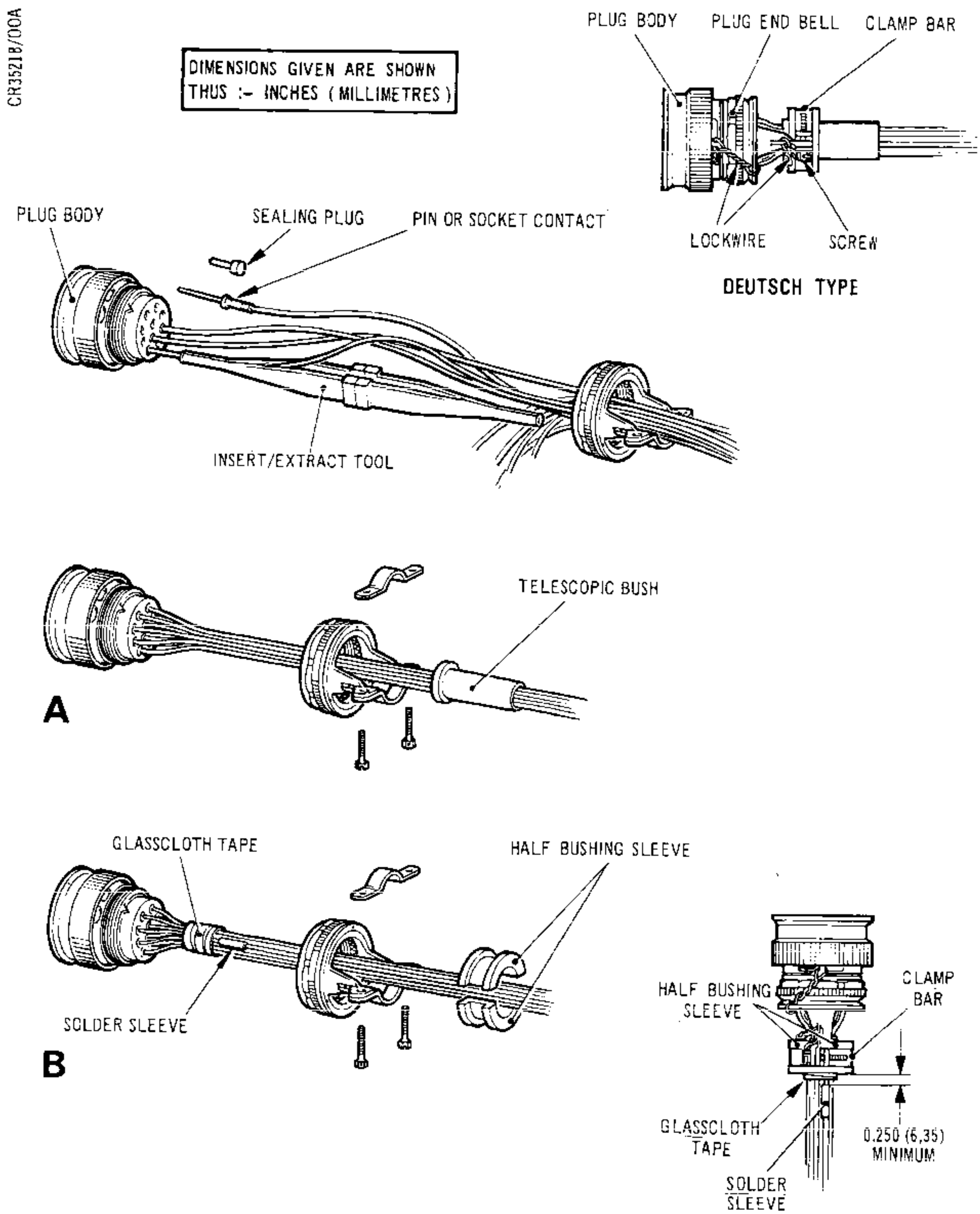
CR 35217/00A

DIMENSIONS GIVEN ARE SHOWN THUS :- INCHES (MILLIMETRES)



Plug Assembly Detail (Pre S.B.OL.593-71-15
and 71-8455-23) (Sheet 2 of 3)
Figure 403

R



R

Plug Assembly Detail (Pre S.B.OL.593-71-15 and 71-8455-23) (Sheet 3 of 3)
Figure 403

(8) On engines to S.B.OL.593-71-15 and 71-8455-23 standard (Ref.Fig.401, 402 and 403), at plug positions H5/B2, D1.5.11, D4, F5 and F6, evenly tighten the clamp bar screws to achieve firm clamping of cable. Maintain an even gap of 0.100 in (2,5 mm) maximum, between clamp bar and mating end bell.

(9) On engines to S.B.OL.593-71-15 and 71-8455-23 standard (Ref.Fig.401, 402 and 403), at positions C3, C4, C5, C6, C7, C8, D2, D7, D9, D10, E1.2.3, E5, E8, E9, E11, F1, F2, G1, G4, G6, G9, G10, H1 and H3, tighten clamp screws until there is no gap between clamp bar and mating end bell.

(10) Wire-lock plug assembly.

(a) Wire-lock screws to plug end bell.

(b) Wire-lock end bell to plug body.

C. Assemble Plug End without Telescopic Bush (Ref.Fig.403) (detail B).

NOTE: If electrical harness plug clamp bar screws to S.B.OL.593-71-8502-22 standard have been used, ensure that the shorter screws to this standard are used when plugs are re-assembled.

(1) Assemble plug contacts as detailed in B, paragraphs (1) to (5).

(2) On engines to pre S.B.OL.593-71-15 and 71-8455-23 standard at disconnect points B to H (Ref.Figs.401 and 402), wrap glasscloth tape round the cores to a width of 1.0 in. (25,4 mm) central to clamp bar position when assembled. Apply tape, so that, when the half clamps and clamp bars are assembled and firm hand pressure is applied, a gap of between 0.060 and 0.10 in. (1,5 and 2,5 mm) is obtained between clamp bar and mating faces.

(3) Secure clamps.

(a) With half clamps in position assemble clamp bars and retain with screws and flat washers lightly tightened.

(b) Verify that there is a distance of 0.250 in. (6,35 mm) between adjacent faces of a solder sleeve and half clamps before tightening clamp bars.

(c) Secure clamp bars with two screws tightened equally until no gap is visible.

(4) Wire-lock plug assembly.

(a) Wire-lock screws to plug end bell.

(b) Wire-lock end bell to plug body.

(5) On engines to S.B.OL.593-71-15 and 71-8455-23 standard at disconnect points B to H and plug positions H4/B1, C1, C2 and G8 (Ref.Fig.401 and 402), wrap glasscloth tape round the cores to a width of 1.0 in. (25,4 mm) central to clamp bar and end bell position when assembled.

(a) At disconnect points B to H place half bushing sleeves over wrapped section, then apply hand pressure to half bushing sleeves and ensure that cable assembly is firmly clamped.

(b) With clamp bar and end bell in position retain with screws lightly tightened.

(b1) Ensure that there is a distance of 0.250 in. (6,35 mm) between adjacent faces of a solder sleeve and half bushing sleeves before tightening clamp bar to end bell.

(b2) Secure assembly with two screws tightened until half bushing sleeves are held together without a gap.

<u>NOTE:</u> The resultant gap between clamp bar and mating end bell is not governed dimensionally after tightening.

(b3) Wire-lock screws to plug end bell and end bell to plug body.

(c) At plug positions H4/B1, C1, C2 and G8, assemble clamp bar and end bell over wrapped section and retain with screws lightly tightened.

(c1) Tighten screws until cable assembly is firmly gripped and a gap of 0.100 in. (2,5 mm) maximum is obtained between clamp bar and end bell.

(C2) Wire-lock screws to plug end bell and end bell to plug body.

D. Assemble Plug End with Cable Spacers and Telescopic Bush (Ref.Fig.403, detail C).

(1) Assemble plug contacts as detailed in B, paragraphs (1) to (5).

(2) On engines to pre SB.OL.593-71-15 and SB.71-8455-23 standards at plug positions C1, C2 (Pre-SB OL593-71-8988-32) and G8 assemble cable spacers into positions.

(3) Slide telescopic bush into position over cable spacers and in position on lead. Secure with clamp bars, screws and flat washers.

(4) Tighten the two screws until the telescopic bush is firmly gripped and there is not gap between clamp bars and end bell.

(5) Wire-lock plug assembly.

(a) Wire-lock screws to plug end bell.

(b) Wire-lock end bell to plug body.

5. Complete the Procedure

A. Carry out the Checks Specified in 71-50-00, Inspection/Check.

B 6. Concorde Engine Harness - HTMAS Self Locking Connectors

B A. It has been established (by trial modification and
B consultation with Rolls-Royce) that HTMAS self locking
B connectors do not require wirelocking other than for
B services that have particular flight connotations which
B make it prudent to wirelock.

B A list of engine harness connectors which must remain
B wirelocked is set out below, but all other engine harness
B connectors do not require wirelocking.

B Olympus Engine Harness Connectors which MUST be Wirelocked

B B1 - LP Pulse Probe
B B2 - HP Pulse Probe
B C2 - Reheat FCU, Fuel metering valve motor
B C3 - Reheat FCU, Shut-off valve solenoid
B F5 - Engine Mainfuel Flowmeter (Fe)
B F6 - Reheat Fuel Flowmeter (Fr)
B E1 - IDG Disconnect Solenoid

B F Main Engine Disconnect Box
B E Main Engine Disconnect Box
B C Main Engine Disconnect Box
B B Main Engine Disconnect Box

B (As defined in MM 71-50-00 pages 2 and 4, and OHM 71-00-02 pages
B 505 and 507/508). Engine harness connectors other than those
B stated do not require wirelocking.

B B. Tightening Engine Harness HTMAS connectors

B (1) Align keyway and mate connector by holding the
B connector end bell (cable clamp).

B (2) "Wiggle" the end bell and then tighten the coupling
B nut as the plug moves inwards.

B (3) Continue wiggling the end bell and then tightening
B the coupling nut until no further movement of the
B end bell can be made.

B (4) Finger tighten the coupling nut.

B CAUTION: DO NOT OVERTIGHTEN OR DAMAGE MAY OCCUR.

ENGINE ELECTRICAL HARNESS - ADJUSTMENT/TEST

1. General

The test set is designed to check electrical units and their circuits by feeding into the free plugs of the engine electrical harness breakpoint.

2. Tools and Equipment

Engine electrical system test set	PE.21500
TJ harness continuity test set	PE.21200
CO2 aerosol spray	-

3. Use of Test Set

A. It is unnecessary to reset the meter between ranges as zeroing is automatic.

B. Cable looms.

(1) The test set connects direct to the engine harness plugs on uninstalled engines.

R (2) Extension cables B, C, D, E, F, G and H are used to connect the test set to the harness plugs when the engine is installed in the aircraft. Adapters are provided for cables G and H.

(3) Cable J connects the test set to the HP shut-off valve and has two lead end plugs, one for the start solenoid valve receptacle (open) and one for the shut-off solenoid valve receptacle (closed).

(4) The thermocouple test lead (V) terminates in nine pairs of spring clips.

(5) Converter cable X-WYZ is provided for use on the nacelle mounted items in the aircraft connections 1, 2, 3, 4 and 5.

(6) The two power supply cables connect to their respective power supplies, that is:

(a) A.C. supply of 115 ± 5V, 400 ± 4 Hz.

(b) D.C. supply of 28 ± 2 V.

(7) An earth loop cable and earth cable are provided.

(8) Cable loom services are detailed in Table 501.

4. Prepare for Test

A. Check Insulation of the Test Set and Cables.

(1) Connect plugs B, C, D, E, F, G, H, J and V and X-WYZ to their respective sockets on the test set eg., Plug B to Socket B.

(2) Set all switches to OFF. Switches 137 to 141 and 144 are centre off.

(3) Connect 115V, 400 Hz supply and select the a.c. supply switch ON.

(4) Set the meter range selector switch (134) to Insulation 200V range.

(5) Operate switches 1 to 126 and 136 in turn and ensure that the resistance meter pointer remains on INFINITY.

(6) Select the a.c. supply switch OFF.

B. Connect Looms.

R (1) Connect the engine harness plugs to the test set
R (Plug B to Socket B, Plug C to Socket C). Remove
R disconnect box flame shield covers, disconnect
R harness plugs and use the extension cables provided
R for checking installed engines.

(2) Connect the closed and open plugs on loom J to the shut-off solenoid valve and start solenoid valve receptacles on the engine fuel system FCU respectively.

(3) Connect the 28V d.c. supply cable.

(4) Plug the green earth loop cable into the test set and attach the spring clip to the engine casing.

(5) Connect the earth cable to the engine casing and test set frame.

5. Interline Insulation Test

A. General

(1) The interline insulation tests are arranged so

that each line of the engine electrical harness coming through the harness break-point is tested for insulation resistance in turn with all other lines passing through the breakpoint.

(2) Carry out the tests with all accessories fitted
R to the engine and with the air starter shut-off valve
R in the closed position.

(3) If a fault condition occurs while carrying out the tests, the accessory or line involved can be determined from the illustration (Ref. Fig. 501).

B. Before proceeding to operate the inter-line test panel, set switches as follows:

Switch 134	-	INTER-LINE INSULATION
D.C. Supply switch	-	ON
A.C. Supply switch	-	ON
All remaining test set switches	-	OFF
All green OFF lights	-	ILLUMINATED

C. Test Procedure

(1) Set line selector switch 127A to position 1 (OFF light goes out) and set line test switch 127B to position 1. The resistance meter should indicate SHORT.

(2) Progressively turn line test switch 127B from position 1 to position 29 with a pause between positions. Meter readings, at any setting, should be more than 4 M ohms.

(3) Readings of less than 4M ohms are acceptable under the following conditions.

(a) Note the switch positions of the line selector and line test switches giving a faulty reading and use to identify components/circuits by reference to the illustration (Ref. Fig. 501).

(b) Locate the components in Tables 506 to 509, circuit under test and meter reading columns, and add together the minimum insulation resistance values of the components.

(b) Locate the components in Tables 506 to 509 and add together the minimum insulation resistance values of the components.

(c) If the interline insulation reading is equal to or exceeds the sum of the resistance values of the two components, the interline resistance value is acceptable.

(4) Set line test switch 127B to OFF.

(5) Set line test switch 128B to position 30 (light out) and then on to position 58. Observe the meter for readings below 4 M ohms.

(6) Set line test switch 128B to OFF (light on).

(7) Set line test switch 129B to position 59 (light out) and then on to position 87. Observe the meter for readings below 4 M ohms.

(8) Set line test switch 129B to OFF (light on).

(9) Set line test switch 130B to position 88 (light out) and then on to position 116. Observe the meter for readings below 4 M ohms.

(10) Set line test switch 130B to OFF (light on).

(11) Set line test switch 131B to position 117 (light out) and then on to position 145. Observe the meter for readings below 4 M ohms.

(12) Set line test switch 131B to OFF (light on).

(13) The line on line selector switch 127A position 1 has now been tested for insulation against lines 2 to 145 on the B switches.

(14) Set line selector switch 127A to position 2 and set line test switch 127B to position 2. The resistance meter should indicate SHORT.

(15) Progressively set B switches from position 3 to position 145 observing the meter and leaving switches in the OFF position when not in use.

(16) Set line selector switch 127A to position 3 and set line test switch 127B to position 3. The resistance meter should indicate SHORT.

(17) Progressively set B switches from position 4 to position 145, observing the meter and leaving switches in the OFF position when not in use.

(18) Repeat the foregoing operations until line selector switch 131A reaches position 145.

(19) On completion of tests, ensure that all interline switches (127-131) are in the OFF position (lights on).

(20) Switch a.c. supply OFF.

(21) Set switch 134 OFF.

6. Accessory Resistance Tests (Tables 502 to 505)

A. Connect cables as follows:

(1) Engine harness cables to test set.

(2) Plugs X - WYZ to test set (required only when testing nacelle mounted accessories).

(3) Cable V from the test set to the thermocouple terminals on the engine.

(4) Cable J from the test set to the HP shut-off valve.

(5) Supply cables.

(6) Earth loop cable.

(7) Earth cable.

B. Set switches as follows:

(1) Switches 127A to 131A - OFF.

(2) Switches 127B to 131B - OFF.

(3) Switch 132 - OFF.

(4) Switch 134 - OFF.

(5) Switch 136 - OFF.

(6) Switch 137 - Res. and Ins. Test Position.

(7) Switch 138 - Res. and Ins. Test Position.

(8) Switch 140 - OFF.

(9) Switch 142 - OFF.

(10) Switch 143 - OFF.

(11) 115V 400 Hz - OFF.

(12) 28V d.c. - ON.

C. Carry out accessory resistance tests. Select each circuit, specified by its switch No., in turn and check meter readings obtained against the tables.

D. After completing the tests, return switches 134 and 136 to OFF.

7. <u>Accessory Insulation Tests</u>

A. Before carrying out the tests listed in Tables 506 to 509 connect cables as detailed in Para. 6A.

B. With the exception of 115V 400 Hz, which must be switched ON, set switches as detailed in Para. 6B.

C. The earth loop lamp must be ON when 50V, 100V and 200V insulation ranges are selected.

D. After completing the tests, return switches 134 and 136 to OFF.

E. Screens to Earth Tests (Table 510).

(1) Set switch 134 to 200V range.

(2) Operate switch 133 and observe that there is no short circuit indication.

(3) If a short circuit is indicated, turn switch 132 from 1 to 22, pausing to observe meter reading which should be above 2 M ohms.

(4) Turn switch 132 to 23 and observe short circuit indication.

(5) After completing the tests, return switch 132 to OFF (light on) and switch 134 to OFF.

8. <u>Accessory Functional Tests</u>

A. Before carrying out the tests listed in Tables 511 to 516 connect cables as detailed in Para. 6A.

B. Set switches as detailed in Para. 6B with the exception of 115V. 400 Hz which must be switched ON.

R C. On completion of tests, set switches 140 and 142 to OFF.

D. Functional Tests of Igniters (Table 513).

(1) Ensure engine is thoroughly drained of residual fuel and wait 20 minutes after completion of any previous motoring cycle or fuel functional test.

(2) Ensure all personnel are clear of engine and carry out procedure given in Table 513.

E. Jet pipe Temperature Thermocouple Harness Functional Check.

R (1) Use test set PE.21200 and carry out the full
R procedure detailed in 77-21-02, Adjustment/Test for
R each thermocouple in turn and check circuit service-
R ability.

9. Complete Tests

A. Remove Test Set

(1) Switch test set OFF, disconnect and blank plugs and receptacles.

B. Restore Engine to Standard

(1) Uninstalled engine - connect harness plugs to transportation receptacles and secure harness with harness transportation supports.

(2) Installed engine - connect engine harness plugs to aircraft receptacles and install disconnect box flame shield covers as detailed in 71-00-12, Removal/Installation.

TEST SET CONNECTOR IDENT.	ENGINE BREAK IDENT.	SERVICES
R B	B	N_2 speed probe (4 circuits) N_1 speed probe (4 circuits)
C	C	Reheat fuel valve Hyd. pump off load valve (alt.) Fuel filter diff. press switch (7 psi) Engine fuel starter pump Reheat purge valve position Engine anti-icing pressure switch Reheat actuator Throttle actuator (main)
D	D	N_1 governor valve IDG mag. trim Engine oil press. transmitter HP turbine bearing oil inlet temp. HP turbine bearing oil drain temp. IDG oil low press. switch Air starter valve IDG speed probe
E	E	Reheat purge valve Engine anti-icing valve IDG disconnect solenoid Engine fuel heater valve R IDG oil inlet temp. IDG oil outlet temp.
F	F	Engine oil tank quantity Main engine flowmeter Reheat flowmeter Engine ignition
G	G	HP valve position indicator Engine fuel recirc. valve

	TEST SET CONNECTOR IDENT.	ENGINE BREAK IDENT.	SERVICES
			Fuel filter inlet temp. Sprayer fuel inlet temp. Engine oil temp.
			Throttle actuator (alt.)
	H	H	Hyd. pump off load valve (main) N2 speed probe (1 circuit) N1 speed probe (3 circuits) Engine oil low press. switch
		HP valve (open)	HP valve open solenoid
	J	HP valve (close)	HP valve open solenoid
	V	9 pairs of spring clips	Thermocouples
	X-WYZ	1	Primary nozzle area indication
R		2	Nozzle trim actuator (alt.)
		3	Reheat ignition
R			Nozzle trim actuator (main)
		4	Thrust reverse command No.2 Thrust reverse command No.1 Silencer control Reverse bucket position detector
		5	Silencer stowed indication) Bucket Engine power auto reduction) micro- Reverse thrust indication) switches

Cable Loom Services
Table 501

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CIRCUIT UNDER TEST	CIRCUIT SWITCH NO.	METER RANGE SELECTOR (SW. 134) OHMS	METER READING (RESISTANCE) OHMS	REMARKS
HP valve position indicator	1	0 - 200	110 - 130	
HP valve (closed)	2	0 - 20	7 - 12	
HP valve (open)	3	0 - 20	7 - 12	
Reheat fuel valve	4	0 - 200	18 - 26	
Reheat purge valve	5	0 - 200	30 - 40	
Engine anti-icing valve	6	0 - 20	14 - 20	
Hydraulic pump((main)	7	0 - 200	20 - 30	
off load valve((alt.)	8	0 - 200	20 - 30	
Fuel recirculation valve	9	0 - 200	12 - 20	
IDG disconnect solenoid	10	0 - 20	4 - 9	
Fuel heater valve	11	0 - 20	16 ± 2	
N_1 governor valve	12	0 - 200	30	
Engine) Overfull oil)	14	0 - 4 K	Full scale	Open circuit
tank) Contents	15	0 - 4 K	0-3070 ± 5% in 150 ohms steps to 2250 ohms and one step of 820 ohms	Dip tank contents and refer to Fig.502 (Meter reads half value).
R				
IDG mag. trim	21	0 - 2 K	400 - 500	
(throttle ((alt.)	22	0 - 2 K	520 - 670	
(throttle N_2 ((main)	23	0 - 2 K	520 - 670	
speed (N_2 rpm	24	0 - 2 K	520 - 670	
probes(ground (testing	25	0 - 2 K	520 - 670	
(air start	26	0 - 2 K	520 - 670	

CIRCUIT UNDER TEST	CIRCUIT SWITCH NO.	METER RANGE SELECTOR (SW.134) OHMS	METER READING (RESISTANCE) OHMS	REMARKS
(throttle ((alt.)	27	0 - 2 K	460 - 600	
(decel. (system	28	0 - 2 K	460 - 600	
(throttle ((main)	29	0 - 2 K	460 - 600	
(decel. to N1 (intake	30	0 - 2 K	460 - 600	
speed (N1 rpm	31	0 - 2 K	460 - 600	
probes(reheat (control	32	0 - 2 K	460 - 600	
(ground (testing	33	0 - 2 K	460 - 600	
Engine oil pressure transmitter	34	0 - 200	60 - 75	
Engine oil pressure transmitter	35	0 - 200	60 - 75	
Anti-icing pressure switch	36	0 - 4 K	Full scale	)Switch)open)circuit
Reheat purge valve position	40	0 - 2 K	270 - 450	
Reheat purge valve position	41	0 - 2 K	210 - 310	
Fuel starter pump	44	0 - 200	55 - 65	
Fuel starter pump	45	0 - 200	55 - 65	

NOTE: Disconnect fuel starter pump and replace with fuel starter pump test plug. Reconnect fuel starter pump after test.

Fuel starter pump	44	0 - 20	3 - 5	
Fuel starter pump	45	0 - 20	3 - 5	
HP turbine oil inlet temp. thermometer	50	0 - 200	126 - 146	
HP turbine brg. oil drain temp. thermometer	51	0 - 200	126 - 146	
Fuel filter inlet temp. thermometer	52	0 - 200	126 - 146	
Fuel nozzle inlet temp. thermometer	53	0 - 200	126 - 146	

	CIRCUIT UNDER TEST	CIRCUIT SWITCH NO.	METER RANGE SELECTOR (SW.134) OHMS	METER READING (RESIS-TANCE) OHMS	REMARKS
	Engine oil temp. thermometer	54	0 - 200	126 - 146	
	IDG oil inlet temp. thermometer	55	0 - 200	126 - 146	
	IDG oil outlet temp. thermometer	56	0 - 200	126 - 146	
	(motor	57	0 - 200	25 - 35	
	(motor	58	0 - 2 K	1050 - 1200	
	Reheat (motor	59	0 - 2 K	100 - 140	
	flow- (servo meter (control (density	60	0 - 2 K	250 - 350	
	(P.U. (probe 1	61	0 - 2 K	1500 - 1700	
	(motor (	62	0 - 200	25 - 35	Pins A and B
	(motor Main (	63	0 - 2 K	1050 - 1200	Pins A and C
	engine (motor flow- (	64	0 - 2 K	100 - 140	Pins D and A
	meter (servo (control (density	65	0 - 2 K	250 - 350	Pins F and E
	(P.U.probe 1 (	66	0 - 2 K	1500 - 1700	Pins J and I
R R	Engine oil low pressure switch	67	0 - 20	2 - 8	)Depends)on
R R R	IDG oil low pressure switch	68	0 - 20	2 - 8	)cable)resis- tance.
	Fuel filter diff. press. switch (7 psi)	71	0 - 4 K	Full scale	)Switch)open)cir-)cuit.
	IDG speed probe	110	0 - 200	20 - 25	

NOTE: On Pre S.B. OL.593-71-4 standard engines, circuit switch No. 113 and 116 will give open circuit.

Engine flowmeter servo control	113	0 - 200	55 - 75	
Engine flowmeter	114	0 - 4 K	2100 - 2300	Meter

CIRCUIT UNDER TEST	CIRCUIT SWITCH NO.	METER RANGE SELECTOR (SW.134) OHMS	METER READING (RESISTANCE) OHMS	REMARKS
				reads half value
P.U. probe 2 Reheat flowmeter	115	0 - 4 K	2100 - 2300	Meter reads half value
P.U. probe 2 Reheat flowmeter servo control	116	0 - 200	55 - 75	
Turbine (terminal 8	118	0 - 20	1 ± 0.5	Turbine bearing hot vent
cooling (terminal 7	119	0 - 20	3 ± 1	HP compressor rear labyrinth
thermo-(terminal 5	120	0 - 20	1 ± 0.5	HP and LP turbine bearing vent
couples(terminal 4	121	0 - 20	2 ± 1	LP and HP compressor thrust bearing Vent
(terminal 6	122	0 - 20	2 ± 1	HP turbine cooling air
TJ (terminal 1	123	0 - 20	3 ± 1	Jet pipe
Thermo-(terminal 2	124	0 - 20	3 ± 1	Jet pipe
couples(terminal 3	125	0 - 20	3 ± 1	Jet pipe
(terminal 12	126	0 - 20	2 ± 1	HP compressor delivery air

Resistance Tests on Engine Mounted Accessories
Table 502

CIRCUIT UNDER TEST	POSITION OF SWITCH NO.136	METER RANGE SELECTOR (SW.134) OHMS	METER READING (RESISTANCE OHMS	REMARKS
Throttle actuator, motor Ref. (main)	1	0 - 200	30 - 38	
Throttle actuator, motor control (main)	2	0 - 20	2 - 5	
Throttle actuator tacho and P.O. ref. (main)	3	0 - 200	38 - 46	
Throttle actuator, tacho signal (main)	4	0 - 2 K	741 - 919	
Throttle actuator, motor brake (alt.)	5	0 - 20	2 - 5	
Throttle actuator, P.O. signal (main)	6	0 - 200	120 - 145	
Throttle actuator motor ref. (alt.)	7	0 - 200	30 - 38	
Throttle actuator motor control (alt.)	8	0 - 20	2 - 5	
Throttle actuator, tacho and P.O. ref. (alt.)	9	0 - 200	38 - 46	
Throttle actuator, tacho signal (alt.)	10	0 - 2 K	741 - 919	
Throttle actuator motor brake (main)	11	0 - 20	2 - 5	
Throttle actuator, P.O. signal (alt.)	12	0 - 200	120 - 145	
Reheat, tacho signal	25	0 - 4 K	1500 - 1700	Meter reads half value
Reheat, motor control	26	0 - 20	2 - 5	
R Reheat	27	0 - 200	25 - 35	
R Reheat, tacho ref.	28	0 - 2K	360 - 460	

Resistance Tests on Engine Mounted A.C. Actuators
Table 503

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CIRCUIT UNDER TEST	CIRCUIT SWITCH NO.	METER RANGE SELECTOR (SW.134) OHMS	METER READING (RESISTANCE) OHMS	REMARKS
Primary nozzle area (indication)	72	0 - 200	70 - 80	
Primary nozzle area (indication)	73	0 - 200	70 - 80	
Reheat ignition	78	0 - 20	1.5 - 2.5	
Thrust reverse command 1	79	0 - 200	25 - 30	
Thrust reverse command 2	80	0 - 200	25 - 30	
Silencer solenoid	81	0 - 200	25 - 30	
Thrust rev. eng. wind-down	86	0 - 4 K	Full scale	) When bucket in forward position.
Thrust rev. eng. wind-down	87	0 - 20	0.5 - 1.0	)
Silencer stowed indication	88	0 - 20	0.5 - 1.0	) When lobes retracted.
Thrust reverse bucket ind.	89	0 - 20	0.5 - 1.0	) When bucket in forward position.
Thrust reverse bucket ind.	90	0 - 4 K	Full scale	)
Reverse bucket position detector	91			
Reverse bucket position detector	92			

Resistance Tests on Nacelle Mounted Accessories
Table 504

	CIRCUIT UNDER TEST	POSITION OF SWITCH NO.136	METER RANGE SELECTOR (SW.134) OHMS	METER READING (RESISTANCE OHMS	REMARKS
R	Nozzle actuator, motor ref. (main)	13	0 - 200	30 - 38	
R	Nozzle actuator motor control (main)	14	0 - 20	2 - 5	
R	Nozzle actuator tacho and P.O. ref. (main)	15	0 - 200	62 - 72	
R	Nozzle actuator tacho signal (main)	16	0 - 2 K	741 - 919	
R	Nozzle actuator motor brake (alt.)	17	0 - 20	2 - 5	
R	Nozzle actuator P.O. signal (main)	18	0 - 2 K	200 - 250	
R	Nozzle actuator motor ref. (alt.)	19	0 - 200	30 - 38	
R	Nozzle actuator motor control (alt.)	20	0 - 20	2 - 5	
R	Nozzle actuator tacho and P.O. ref. (alt.)	21	0 - 200	62 - 72	
R	Nozzle actuator tacho signal (alt.)	22	0 - 2 K	741 - 919	
R	Nozzle actuator motor brake (main)	23	0 - 20	2 - 5	
R	Nozzle actuator P.O. signal (alt.)	24	0 - 2 K	200 - 250	

R Resistance Tests on Nacelle Mounted Accessories
Table 505

CIRCUIT UNDER TEST	CIRCUIT SWITCH NO.	METER RANGE SELECTOR (SW. 134)	METER READING (RESISTANCE) OHMS	REMARKS
HP valve position indicator	1	200 V	2 M	
HP valve (closed)	2	200 V	2 M	
HP valve (open)	3	200 V	2 M	
Reheat shut-off valve	4	50 V	0.4 M	)0.2 M)actual
Reheat purge valve	5	50 V	0.4 M	)res.
Engine anti-icing valve	6	100 V	0.4 M	
Hydraulic pump((main)	7	200 V	4 M	
off load valve((alt.)	8	200 V	4 M	
Fuel recirculation valve	9	200 V	4 M	
IDG disconnect solenoid	10	200 V	3 M	
Fuel heater valve	11	100 V	0.4 M	
N_1 governor valve	12	200 V	20 M	
Engine oil tank)	14	100 V	2 M	
quantity)	15	100 V	2 M	
R				
IDG mag. trim	21	200 V	2 M	
(throttle	22	200 V	4 M	
((alt.)				
(throttle	23	200 V	4 M	
N_2 ((main)				
speed (N_2 rpm	24	200 V	4 M	
probes(ground test-	25	200 V	4 M	
(ing				
(air start	26	200 V	4 M	
(throttle	27	200 V	4 M	
((alt.)				
(decel.	28	200 V	4 M	
(system				
(throttle	29	200 V	4 M	
N_1 ((main)				
speed (decel. to	30	200 V	4 M	
probes(intake				
(N_1 rpm	31	200 V	4 M	
(reheat	32	200 V	4 M	
(control				
(ground	33	200 V	4 M	

	CIRCUIT UNDER TEST	CIRCUIT SWITCH NO.	METER RANGE SELECTOR (SW.134)	METER READING (RESISTANCE OHMS	REMARKS
	HP valve position (testing	1	200V	2 M	
R	Engine oil pressure transmitter	34	200V	4 M	
R	Engine oil pressure transmitter	35	200V	4 M	
	Anti-icing pressure switch	36	200V	4 M	
	Reheat purge valve position	40	50V	0.4 M	)) Actual
	Reheat purge valve position	41	50V	0.4 M	) res.) 0.2 M
	Fuel starter pump	44	200V	2 M	
	Fuel starter pump	45	200V	2 M	
	HP turbine brg. oil inlet temp. thermometer	50	200V	2 M	
	HP turbine brg. oil drain temp. thermometer	51	200V	2 M	
	Fuel filter inlet temp. thermometer	52	200V	2 M	
	Sprayer fuel inlet temp. thermometer	53	200V	2 M	
	Engine oil temp. thermometer	54	200V	2 M	
	IDG oil inlet temp. thermometer	55	200V	2 M	
R	IDG outlet temp. thermometer	56	200V	2 M	
	(motor	57	200V	2 M	
	Reheat (motor	58	200V	2 M	
	flow- (motor	59	200V	2 M	
	meter (servo con- (trol density	60	200V	2 M	
	(P.U.probe	61	200V	2 M	
	(motor	62	200V	2 M	
	Main (motor	63	200V	2 M	
	engine (motor	64	200V	2 M	
	flow- (servo con- meter (trol density	65	200V	2 M	
	(P.U.probe	66	200V	2 M	
	Engine oil pressure	67	200V	2 M	

CIRCUIT UNDER TEST	CIRCUIT SWITCH NO.	METER RANGE SELECTOR (SW. 134)	METER READING (RESIS-TANCE) OHMS	REMARKS
HP valve position switch	1	200 V	2 M	
IDG oil pressure switch	68	200 V	2 M	
Fuel filter diff. press. switch (7 psi)	71	200 V	2 M	
IDG speed probe	110	100 V	2 M	

NOTE: On Pre SB OL593-71-4 standard engines, circuit switch No. 113 and 116 will give open circuit.

Engine flowmeter servo control	113	200 V	2 M	
Engine flowmeter P.U. probe 2	114	200 V	2 M	
Reheat flowmeter P.U. probe 2	115	200 V	2 M	
Engine flowmeter servo control	116	200 V	2 M	
Turbine (terminal 8	118	100 V	2 K	
cooling (terminal 7	119	100 V	50K	
thermo- (terminal 5	120	100 V	50K	
couples (terminal 4	121	100 V	50K	
(terminal 6	122	100 V	50M	
R TJ (terminal 1	123	50 V	10K	
R thermo- (terminal 2	124	50 V	10K	
R couples (terminal 3	125	50 V	10K	
(terminal12	126	100 V	50K	
Air starter valve	open/ close	200 V	1 M	Operate switch 141

Insulation Tests on Engine Mounted Accessories
Table 506

R

CIRCUIT UNDER TEST	POSITION OF SWITCH NO. 136	METER RANGE SELECTOR (SW.134)	METER READING (RESIS-TANCE) OHMS	REMARKS
Throttle actuator, motor ref. (main)	1	200V	5 M	
Throttle actuator, motor control (main)	2	200V	5 M	
Throttle actuator, tacho and P.O.ref. (main)	3	200V	5 M	
Throttle actuator, tacho signal (main)	4	200V	5 M	
Throttle actuator, motor brake (alt.)	5	200V	5 M	
Throttle actuator, P.O. signal (main)	6	200V	5 M	
Throttle actuator, motor ref. (alt.)	7	200V	5 M	
Throttle actuator, motor control (alt.)	8	200V	5 M	
Throttle actuator, tacho and P.O. ref. (alt.)	9	200V	5 M	
Throttle actuator, tacho signal (alt.)	10	200V	5 M	
Throttle actuator, motor brake (main)	11	200V	5 M	
Throttle actuator, P.O.signal (alt.)	12	200V	5 M	
Reheat actuators, tacho signal	25	200V	0.5 M	
Reheat actuator, motor control	26	200V	0.5 M	
Reheat actuator, tacho and motor ref.	27	200V	0.5 M	

Insulation Tests on Engine Mounted A.C. Actuators
Table 507

CIRCUIT UNDER TEST	CIRCUIT SWITCH NO.	METER RANGE SELECTOR (SW.134)	METER READING (RESISTANCE) OHMS	REMARKS
Primary nozzle area (indication)	72	50V	0.4 M	
Primary nozzle area (indication)	73	50V	0.4 M	
Reheat ignition	78	50V	0.4 M	
Thrust reverse command 1	79	50V	0.4 M	
Thrust reverse command 2	80	50V	0.4 M	0.2 M actual resistance
Silencer solenoid	81	50V	0.4 M	
Thrust rev. eng. wind-down	86	50V	0.4 M	
Thrust rev. eng. wind-down	87	50V	0.4 M	
Silencer stowed indication	88	50V	0.4 M	
Thrust reverse, bucket indication	89	50V	0.4 M	
Thrust reverse bucket indication	90	50V	0.4 M	
Reverse bucket position detector	91	50V	1.0 M	0.5 M actual resistance
Reverse bucket position detector	92	50V	1.0 M	

Insulation Tests on Nacelle Mounted Accessories
Table 508

CIRCUIT UNDER TEST	POSITION OF SWITCH NO.136	METER RANGE SELECTOR (SW.134)	METER READING (RESIS-TANCE) OHMS	REMARKS
Nozzle actuator motor ref. (main	13	200V	5 M	
Nozzle actuator motor control (main)	14	200V	5 M	
Nozzle actuator tacho and P.O.ref. (main)	15	200V	5 M	
Nozzle actuator tacho signal (main)	16	200V	5 M	
Nozzle actuator motor brake (alt.)	17	200V	5 M	
R Nozzle actuator P.O. signal (main)	18	200V	5 M	
Nozzle actuator motor ref. (alt.)	19	200V	5 M	
Nozzle actuator motor control (alt.)	20	200V	5 M	
Nozzle actuator tacho and P.O. ref. (alt.)	21	200V	5 M	
Nozzle actuator tacho signal (alt.)	22	200V	5 M	
Nozzle actuator motor brake (main)	23	200V	5 M	
Nozzle actuator P.O. signal (alt.)	24	200V	5 M	

Insulation Tests on Nacelle Mounted A.C. Actuators
Table 509

SWITCH 132 POSITION	ACCESSORY SCREEN
1	HP valve position indicator
2	Main engine flowmeter (servo control density)
R 3	Cancelled
4	IDG speed probe
5	Reheat flowmeter (P.U. probe 1)
6	Main engine flowmeter (P.U. probe 1)
7	IDG mag. trim
8	N_2 speed probe (throttle alt.)
9	N_2 speed probe (throttle main)
10	N_2 speed probe (N_2 rpm)
11	N_2 speed probe (ground testing)
12	N_2 speed probe (air start)
13	N_1 speed probe (throttle alt.)
14	N_1 speed probe (decel. system)
15	N_1 speed probe (throttle main)
16	N_1 speed probe (decel. to intake)
17	N_1 speed probe (N_1 rpm)
18	N_1 speed probe (reheat control)
19	N_1 speed probe (ground testing)
20	Main engine flowmeter (P.U. probe 2)
21	Reheat flowmeter (P.U. probe 2)
22	Reheat flowmeter servo control density
23	Reheat flame detector (earthed on engine)

Screen to Earth Tests
Table 510

CIRCUIT UNDER TEST	CIRCUIT SWITCH NO.	SOLENOID CURRENT METER	REMARKS
HP Valve (closed)	2	2.5 ± 0.5 A	
HP Valve (open)	3	2.5 ± 0.5 A	
Reheat shut-off valve	4	0.85 ± 0.25 A	
Reheat purge valve	5	0.85 ± 0.25 A	
Engine anti-icing valve	6	1.5 ± 0.5 A	
Hydraulic pump((main)	7	1.5 ± 0.5 A	
off Load valve((alt.)	8	1.5 ± 0.5 A	
Fuel re-circulation valve	9	1.5 ± 0.5 A	
IDG disconnect solenoid	10	7 amps max.	To be manually reset
Fuel heater valve	11	1.5 ± 0.5 A	

Functional Test of Engine Mounted Solenoid Controls
Table 511

CIRCUIT UNDER TEST	Throttle actuator (main) Test 1	Throttle actuator (main) Test 2	Throttle actuator (main) Test 3	Throttle actuator (main) Test 4	Throttle actuator (alterna-tive Test 1
POSITION OF ACTUATOR SELECTOR SW. 142	Throttle (main)	Throttle (main)	Throttle (main)	Throttle (main)	Throttle (alterna-tive)
A.C. ACTUATOR SW. 140	Tacho	Tacho	Pick off	Pick off	Tacho
A.C. ACTUATOR SW.139	Pos.1	Pos.2	Pos.1	Pos.2	Pos.1
BRAKE CURRENT	2A (max.)	2A (max.)	2A (max.)	2A (max.)	2A (max.)
MOTOR CONTROL CURRENT	1A (max.)	1A (max.)	1A (max.)	1A (max.)	1A (max.)
P.O./TACHO SIGNAL	Left of zero	Right of zero	See remarks	See remarks	Left of zero
REMARKS	Actuator runs to open	Actuator runs to closed	Pointer starts slightly right of zero, through zero to full scale left and back slightly	Pointer goes to full scale then back through zero and stops slightly right of zero	Actuator runs to open

R

Functional Tests of Engine Mounted A.C. Actuators
Table 512 (continued)

CIRCUIT UNDER TEST	Throttle actuator (altern- ative Test 2	Throttle actuator (altern- ative Test 3	Throttle actuator (altern- ative Test 4	Reheat actuator Test 1	Reheat actuator Test 2
POSITION OF ACTUATOR SELECTOR SW. 142	Throttle altern- ative	Throttle altern- ative	Throttle altern- ative	Reheat	Reheat
A.C. ACTUATOR SW. 140	Tacho	Pick off	Pick off	Tacho	Tacho
A.C. ACTUATOR SW. 139	Pos.2	Pos.1	Pos.2	Pos.1	Pos.2
BRAKE CURRENT	2A (max.)	2A (max.)	2A (max.)	No reading	No reading
MOTOR CONTROL CURRENT	1A (max.)	1A (max.)	1A (max.)	2A (max.)	2A (max.)
R P.O./TACHO SIGNAL	Right of zero	See remarks	See remarks	Left of zero	Right of zero
REMARKS R	Actuator runs to closed	Pointer starts slightly right of zero, through zero to full scale left and back slightly	Pointer goes to full scale then back through zero and stops slightly right of zero	Actuator runs to closed	Actuator runs to open

Functional Tests of Engine Mounted A.C. Actuators
Table 512 (concluded)

FUNCTION
R WARNING: ENGINE MUST BE CLEAR OF PERSONNEL, FREE OF FUEL R DRAINAGE AND PRECAUTIONARY WAITING PERIOD R COMPLETED BEFORE COMMENCING TEST. R Operate switch 143 (lift to release); light must come 'ON' Operate switch 144 to position L; this will fire left hand igniter. Operate switch 144 to position R; this will fire right hand igniter. Return switch 143 of 'OFF'.

Functional Tests of Igniters
Table 513

FUNCTION
Operate switch 141 to open and close positions, the appropriate indicator should be illuminated. Solenoid current meter should read 3 amps. max.

Functional Test of Air Starter Valve
Table 514

CIRCUIT UNDER TEST	Nozzle actuator (main) Test 1	Nozzle actuator (main) Test 2	Nozzle actuator (main) Test 3	Nozzle actuator (main) Test 4
POSITION OF ACTUATOR SELECTOR SW. 142	Nozzle main	Nozzle main	Nozzle main	Nozzle main
A.C. ACTUATOR SW. 140	Tacho	Tacho	Pick off	Pick off
A.C. ACTUATOR SW. 139	Pos. 1	Pos. 2	Pos. 1	Pos. 2
BRAKE CURRENT	2A (max.)	2A (max.)	2A (max.)	2A (max.)
MOTOR CONTROL CURRENT	1A (max.)	1A (max.)	1A (max.)	1A (max.)
P.O./TACHO SIGNAL	Left of zero	Right of zero	See remarks	See remarks
REMARKS	Actuator runs to open	Actuator runs to closed	Pointer swings from full scale right through zero and stops slightly left of zero	Pointer comes back through zero to full scale right

R
R

Functional Tests of Nacelle Mounted A.C. Actuators
Table 515 (continued)

R

CIRCUIT UNDER TEST	Nozzle actuator (altern- ative) Test 1	Nozzle actuator (altern- ative) Test 2	Nozzle actuator (altern- ative) Test 3	Nozzle actuator (altern- ative) Test 4
POSITION OF ACTUATOR SELECTOR SW. 142	Nozzle altern- ative	Nozzle altern- ative	Nozzle altern- ative	Nozzle altern- ative
A.C. ACTUATOR SW. 140	Tacho	Tacho	Pick off	Pick off
A.C. ACTUATOR SW. 139	Pos. 1	Pos. 2	Pos. 1	Pos. 2
BRAKE CURRENT	2A (max.)	2A (max.)	2A (max.)	2A (max.)
MOTOR CONTROL CURRENT	1A (max.)	1A (max.)	1A (max.)	1A (max.)
P.O./TACHO SIGNAL	Left of zero	Right of zero	See remarks	See remarks
REMARKS	Actuator runs to open	Actuator runs to closed	Pointer swings from full scale rig through zero and stops slightly left of zero	Pointer comes back through zero to full scale right

Functional Tests of Nacelle Mounted A.C. Actuators
Table 515 (concluded)

CIRCUIT UNDER TEST	CIRCUIT SWITCH NO.	SOLENOID CURRENT M2
Thrust reverse command No. 1	79	1A
R Thrust reverse command No. 2	80	1A
Silencer solenoid	81	1A

Function Tests of Nacelle Mounted Accessories
Table 516

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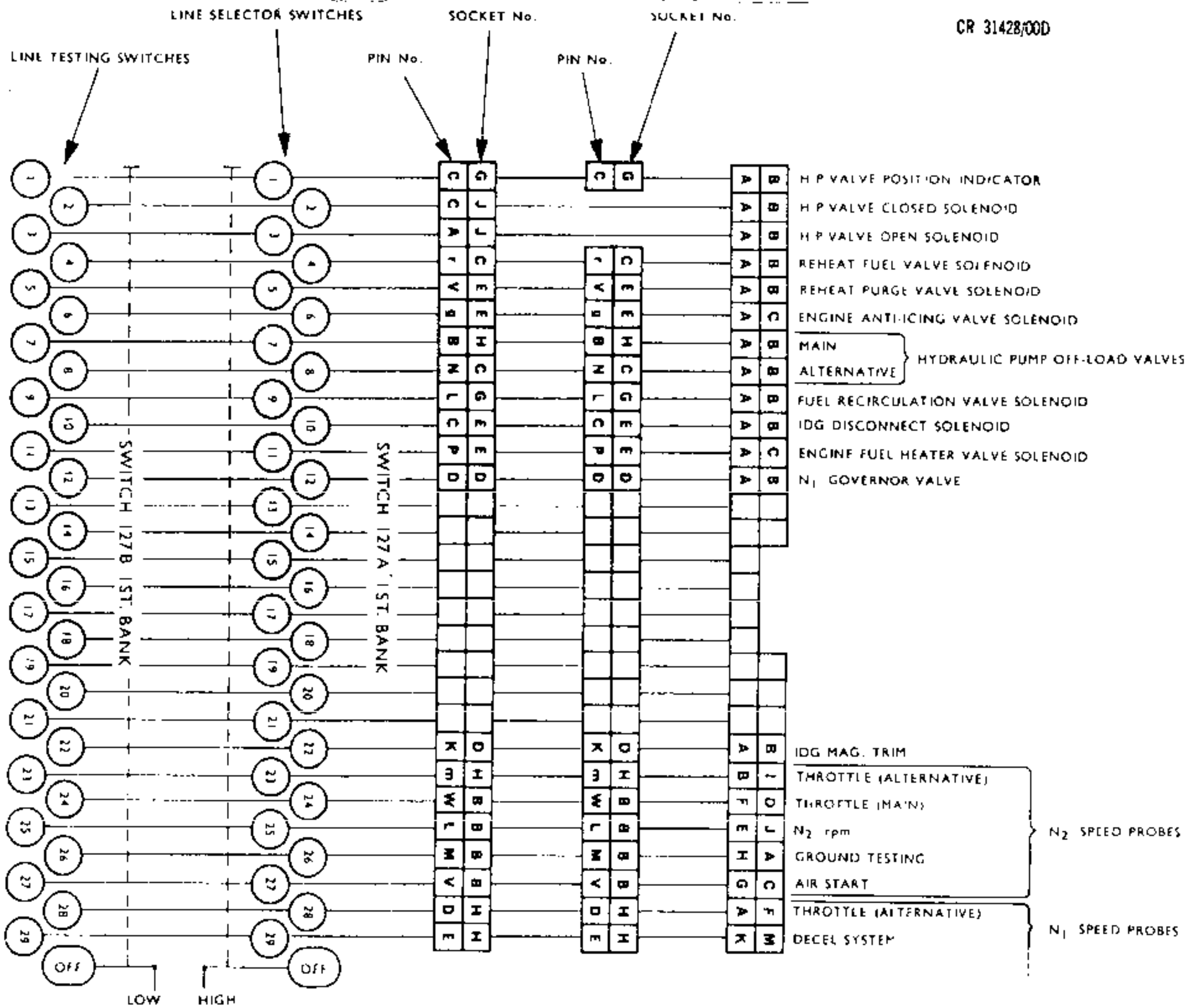
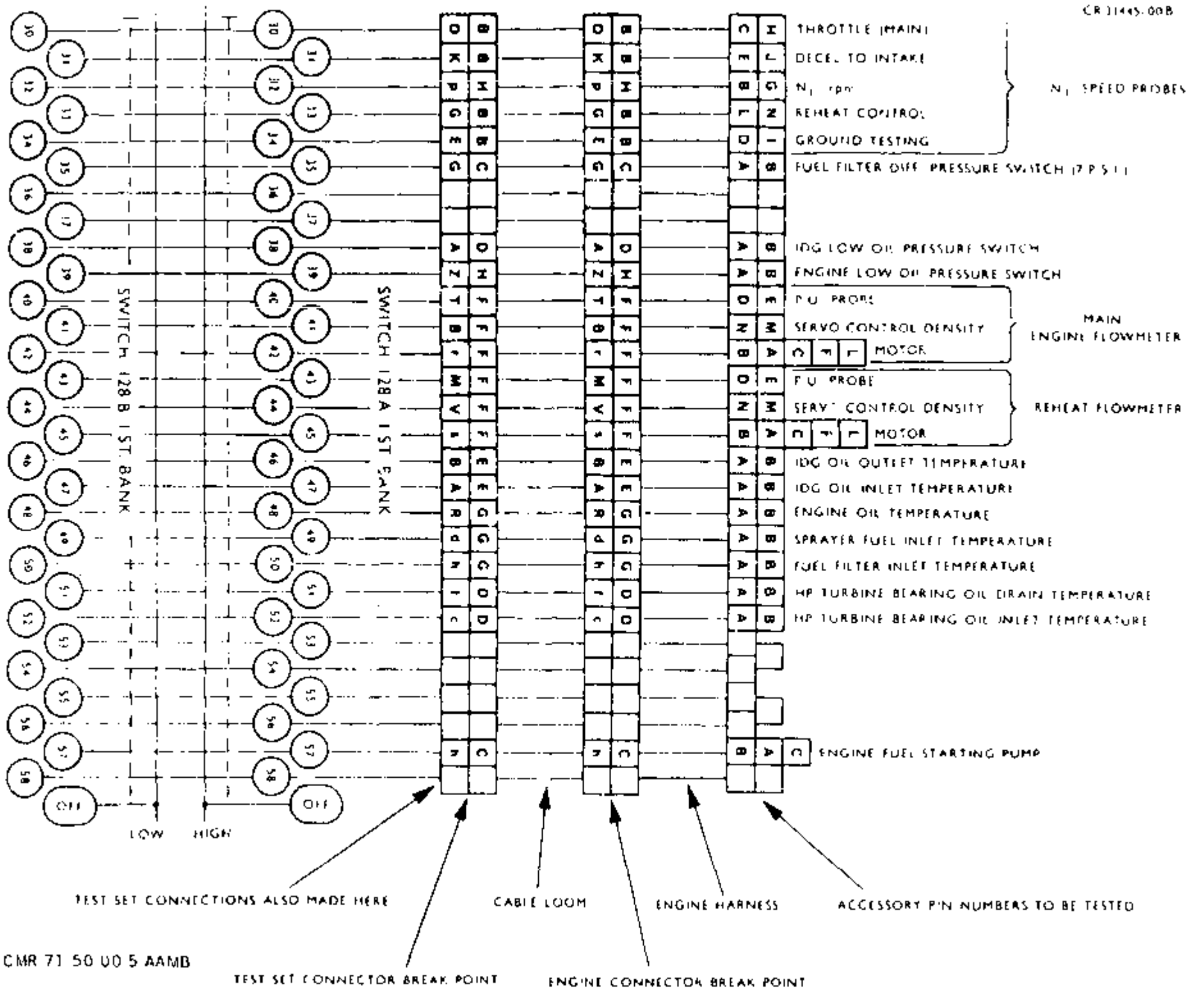


R

Interline Insulation Tests
Figure 501 (Sheet 1 of 5)

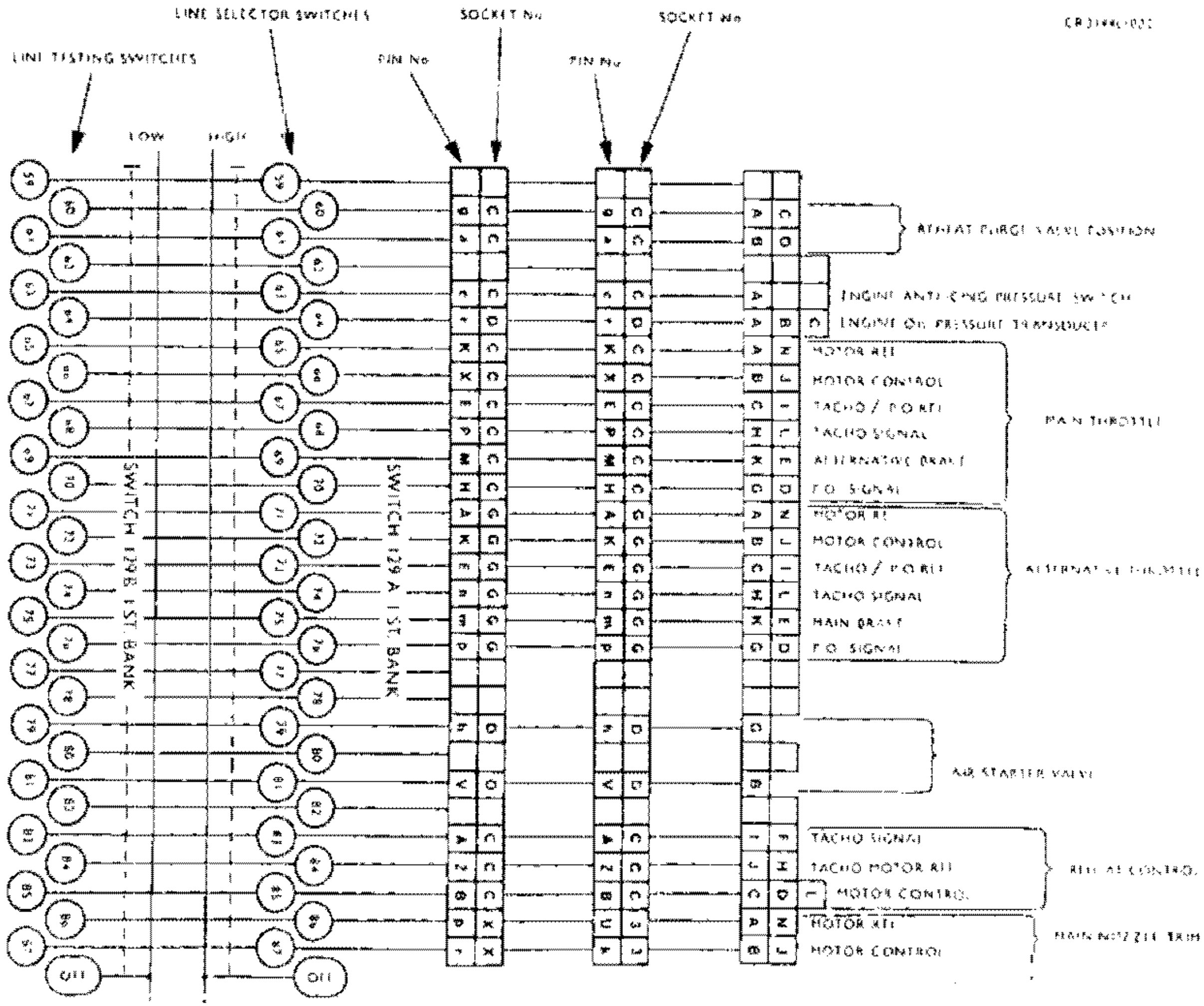


CMR 71 50 00 5 AAMB

Interline Insulation Tests (Sheet 2 of 5)
Figure 501

R

CMR 71 50 00 5 AAMC



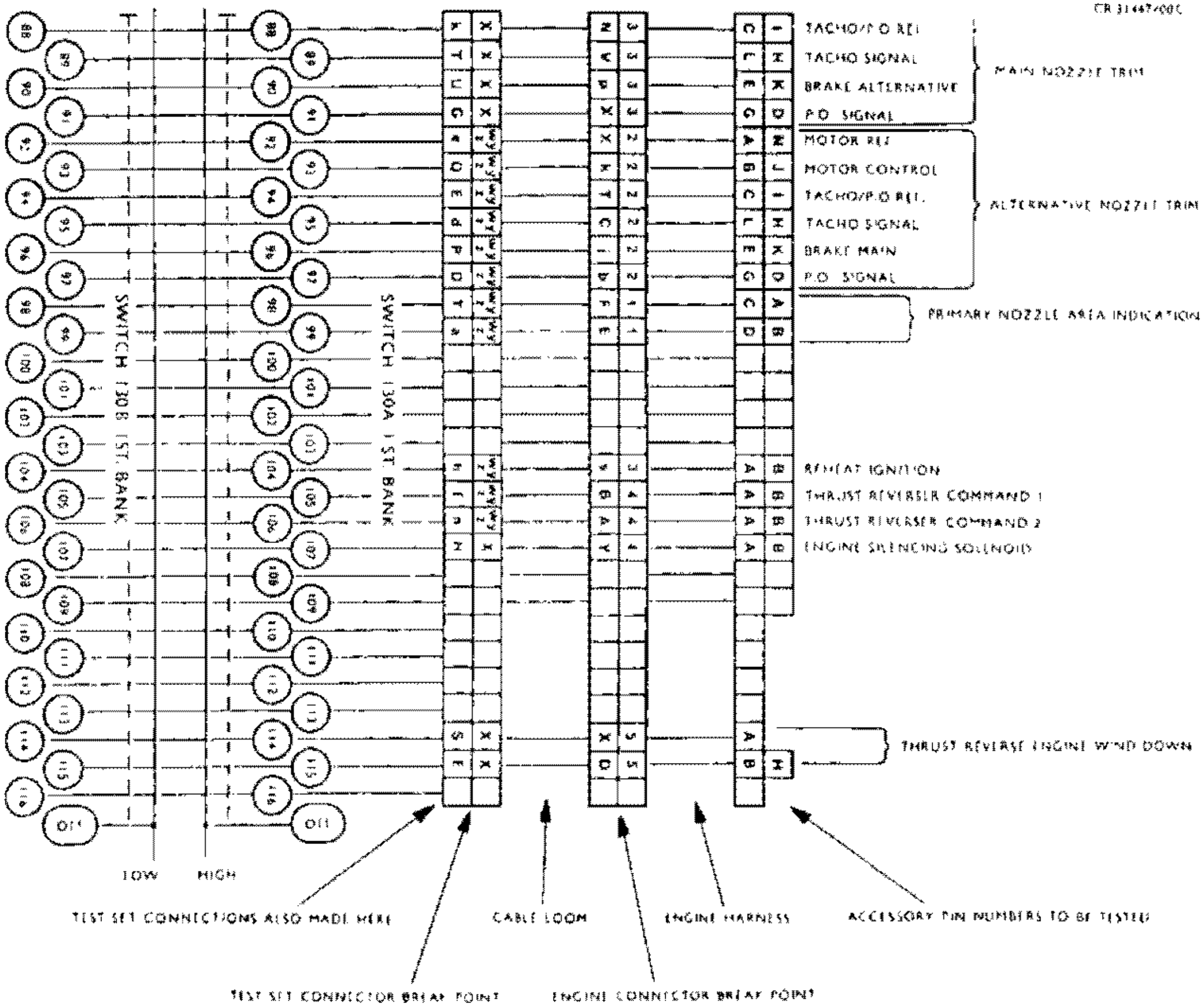
Interline Insulation Tests (Sheet 3 of 5)
Figure 501

R

EFFECTIVITY: ALL

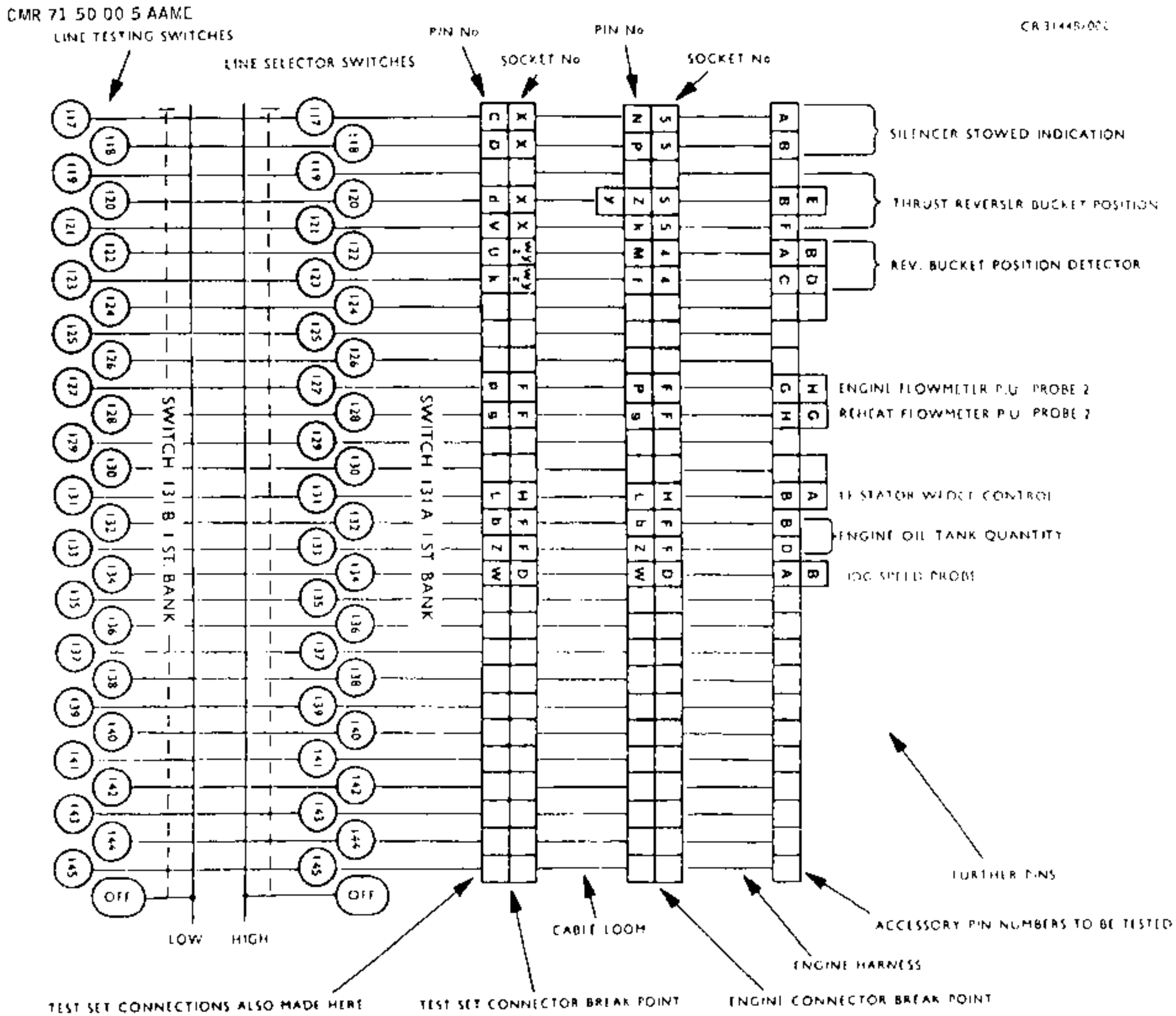
BA

CMR 71 50 00 5 AAMD

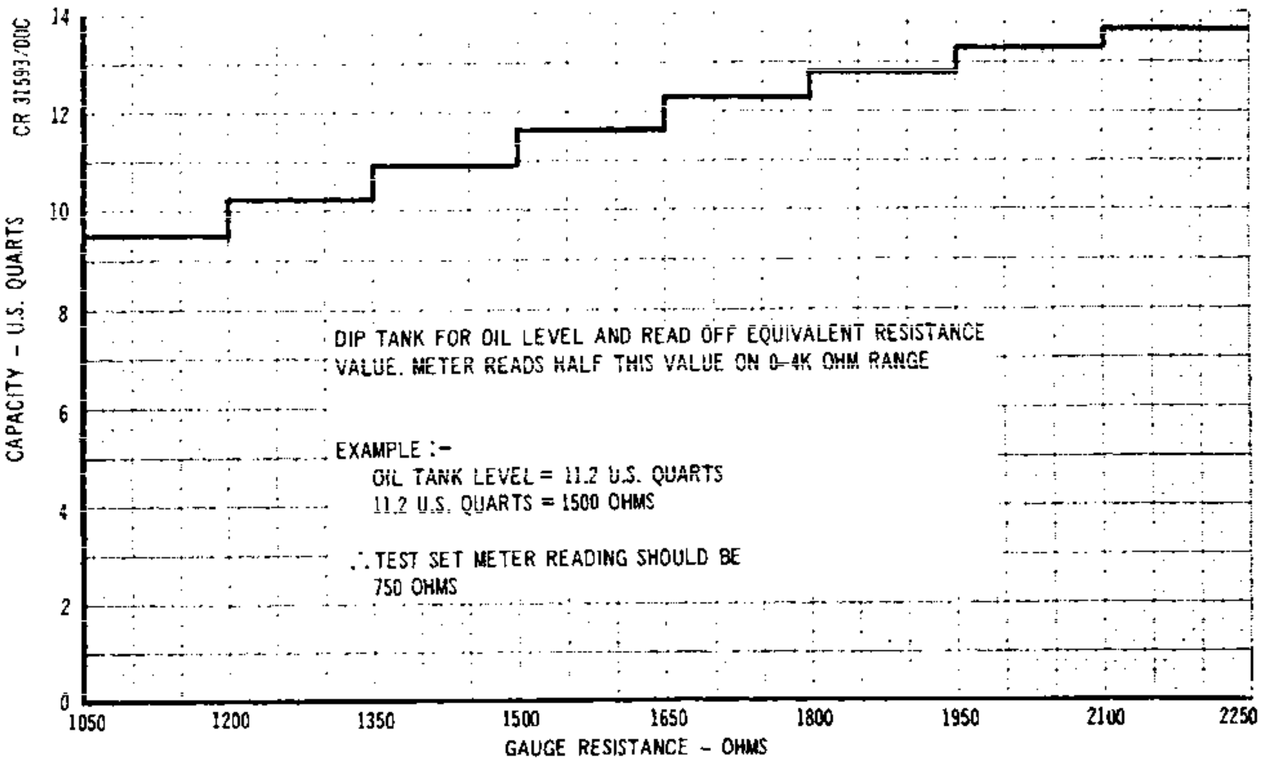


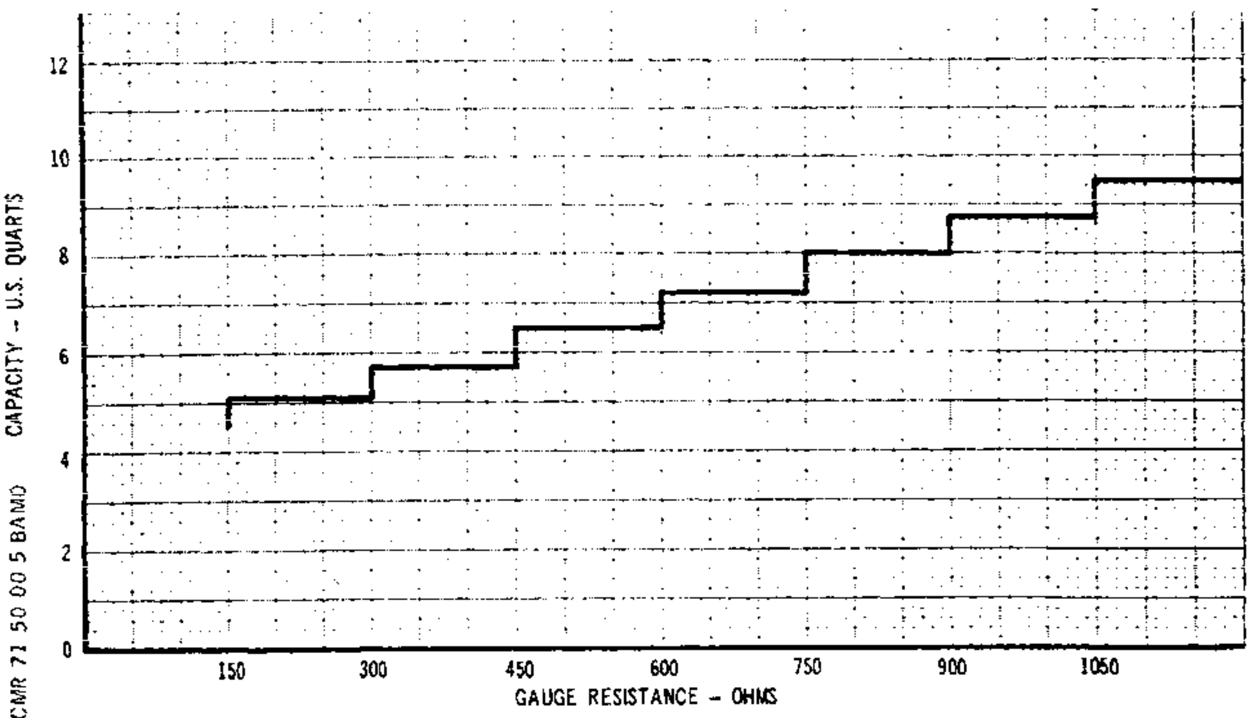
Interline Insulation Tests (Sheet 4 of 5)
Figure 501

R



R Interline Insulation Tests (Sheet 5 of 5)
Figure 501





Oil Level/Gauge Resistance Relationship
Figure 502

R

ENGINE ELECTRICAL HARNESS - INSPECTION/CHECK

1. General

After assembly of pin or socket contacts to a plug, continuity checks are essential to ensure that correct cable/contact location is maintained. Continuity and insulation resistance checks are required to verify general serviceability of lead.

2. Tools and Equipment

Insulation resistance tester (250 V or 500 V)	
Continuity tester	Avo 8 or equivalent

3. Carry Out Test Procedure

CAUTION: DO NOT INSERT A TEST PROBE OF A LARGER DIAMETER OR ONE OR GREATER LENGTH INTO A SOCKET CONTACT.

A. Test Each Core for Continuity.

(1) Check for continuity, with a continuity tester or buzzer/bell/lamp and battery, between affected core ends of plugs at components and disconnect box plug. Do not exceed 24 V d.c. for this test.

(2) Ensure the correct positioning of pin or socket contacts in the plug insulator as detailed in the relevant wiring diagram.

B. Test Lead Screen for Continuity.

CAUTION: DO NOT PUNCTURE LEAD INSULATION OR SLEEVING WHEN USING NEEDLE PROBE AT SLEEVED SCREEN TERMINATION.

(1) Check for continuity, with a continuity tester or buzzer/bell/lamp and battery, between affected screen link wire contact and sleeved screen termination of plugs at components and disconnect box plug. Do not exceed 24 V d.c. for this test.

C. Test Lead for Insulation Resistance.

(1) Each contact to earth.

(a) With a common earth bond applied between disconnect box plug and component plug bodies, use the insulation tester and measure the resistance between each pin or socket contact

and the plug body.

(b) A resistance of less than 20 megohms is not acceptable.

(2) Contact to contact.

(a) Measure the resistance between each contact and every other contact in turn.

(b) A resistance of less than 20 megohms is not acceptable.

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ENGINE ELECTRICAL CABLES - APPROVED REPAIRS

1. Repair of Cables by Splicing, Shrink Sleeving and Wrapping

   A. General

      (1) This repair details in situ rectification of damaged cables within the loom and covers five different types of cable as follows:

         (a) Single core size 20 and size 16 cables (para.3).

         (b) Single and multicore size 20 and size 16 cables screened and jacketed (para.4).

         (c) Low noise cables, screened and jacketed (para.5).

         (d) Single and multicore fireproof cables screened and jacketed (para.6).

         (e) Single fireproof cables jacketed (para.7).

      (2) Three of the five cables can be repaired by alternative procedures determined by the location of the damage within the cable loom and the facilities available.

      (3) Materials necessary to accomplish the repairs are tabled with each repair group; a list of tool manufacturers and suppliers is contained in Table 805.

      (4) Dimensions are shown thus INCHES (MILLIMETRES).

      (5) A log book entry stating the repair number, its suffix letter and the circuit title, must be made after embodiment of each repair.

2. Repair Limitations and General Procedures

   A. The following Limitations and Procedures are to be Applied to all Repairs.

      (1) Not more than two crimp joints shall be used in any one cable run and crimp joints must not be located at cable bends.

      (2) All repaired cables must be subjected to and comply with their relevant electrical circuit test (Ref. 71-50-00, Adjust/Test).

(3) Note position and orientation of all loop clamps on disassembly to facilitate correct assembly positions. All clamp attachment nuts are to be torque-tightened on re-assembly to between 67 and 73 lbf in. (7,6 to 8,2 N.m) using lubricant B as thread lubricant.

(4) Ensure that all safety precautions, warnings applicable whilst working on Polytetrafluoroethylene (PTFE) are strictly adhered to.

(5) An aircraft dressing item, side tray and clamp is located in the engine bay and secures the engine electrical cables prior to the main connector block. It is important that no cable repairs are carried out within 18.00 in. (427,2 mm) of the main break connectors at the aircraft/engine face. At other connections/terminations within the harness the only limitation being the accessibility of the appropriate tools.

3. Repair Single Core Size 20 and Size 16 Cables

WARNING: HEALTH HAZARD. MATERIALS USED IN THESE REPAIRS ARE COMPOSED OF POLYTETRAFLUOROETHYLENE (PFTE). THIS MATERIAL WILL EMIT TOXIC GASES WHEN SUBJECTED TO TEMPERATURES ABOVE 340 DEG C, THE HIGHER THE TEMPERATURE THE GREATER THE EMISSION OF TOXIC GAS. ADEQUATE VENTILATION IS TO BE PROVIDED WITHIN THE WORK AREA AND CLOSE TO THE HEATING SOURCE.

A. Repair B.493642A.

(1) Limitations.

(a) This repair to be confined to cables with damaged insulation not exceeding 0.600 in. (15,24 mm) in length, and where there is sufficient room in the area of damage to operate the necessary tools to effect the repair.

(b) Ensure that the splice positions do not coincide with a loop clamp position.

(c) The repair is to comply with the layout in Figure 801.

(d) Use only materials specified in Table 801.

(2) Procedure.

(a) Cut the cable at the centre of the damaged area, using conventional wire cutters.

(b) Determine the applicable 'Y' dimension by comparison of Figure 801 and Table 801.

(c) Remove the cable insulation from the newly cut cable ends and produce the calculated 'Y' dimension, use a Hellerman Stripping tool. Refer to para.8.A. Hellerman stripping tool instructions.

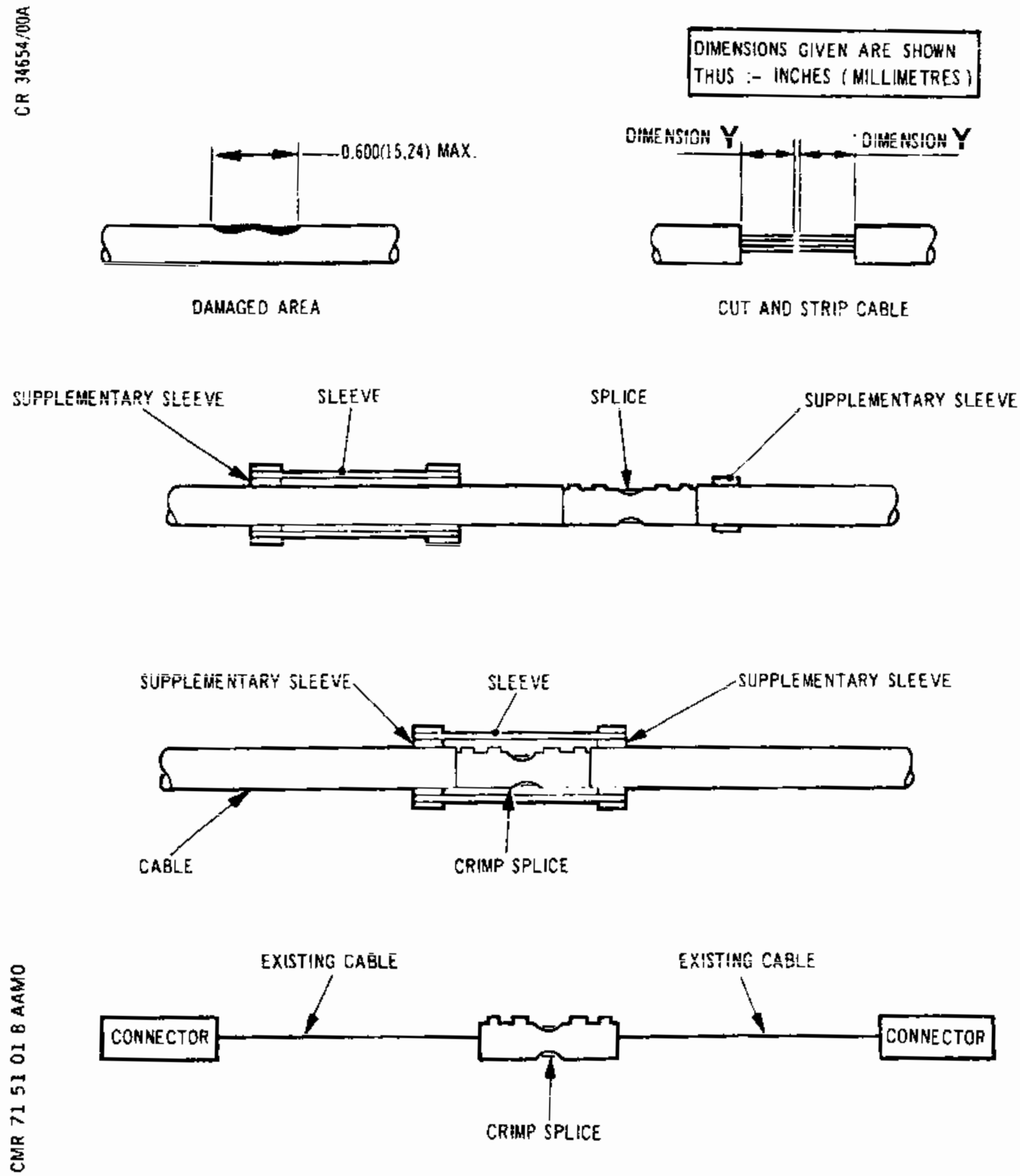
(d) Inspect the stripped ends of the cable to ensure that the core strands are free from damage, that the insulation is cleanly severed and ascertain that the required 'Y' dimension length has been obtained.

(e) Select, from the splice kit (Table 801), the correct sleeve and supplementary sleeves, then slide them over the cable and position them each side of the repair.

(f) Select the appropriate single post insulated butt splice (part of splice kt), then insert the conductor cable ends in the butt splice.

(g) With the conductors abutting at the central indentation of the insulated butt splice, crimp the splice to the conductor cable using the correct crimping tool selected from Table 801.

(h) Slide the sleeves over the repair area as shown in Figure 801 and crimp through the supplementary sleeves to the cable.



Single Core Size 20 and Size 16 Cables
Layout of Repair B.493642A
Figure 801

Cable Size	Splice Kit Ref.	Shrink Sleeve	Dimension Y	Crimp Tool
20/20 All O/Dia's	Raychem Kit W-096-01	-	0.32 - 0.34 in. (8,0 - 8,7 mm)	Raychem AD 1377
	Raychem Kit W-096-02	-	0.32 - 0.34 in. (8,0 - 8,7 mm)	Raychem AD 1377
	AMP 2-326745-1	Raychem W-053-13	0.22 - 0.24 in. (5,5 - 6,0 mm)	AMP 46467
	AMP 322822	Raychem W-053-13	0.22 - 0.24 in. (5,5 - 6,0 mm)	AMP 46447
20/20 O/D 0.046-0.063	AMP Kit 329645	-	0.22 - 0.24 in. (5,5 - 6,0 mm)	AMP 46467
20/20 O/D 0.080-0.100	AMP Kit 329644	-	0.22 - 0.24 in. (5,5 - 6,0 mm)	AMP 46467
	AMP Kit 150771	-	0.22 - 0.24 in. (5,5 - 6,0 mm)	AMP 46467
20/16	Raychem Kit W-096-02	-	0.32 - 0.34 in. (8,0 - 8,7 mm)	Raychem AD 1377
	AMP 322822	Raychem W-053-13	0.22 - 0.24 in. (5,5 - 6,0 mm)	AMP 46447
16/16	Raychem Kit W-096-02	-	0.32 - 0.34 in. (8,0 - 8,7 mm)	Raychem AD 1377
	AMP 322822	Raychem W-053-13	0.22 - 0.24 in. (5,5 - 6,0 mm)	AMP 46447

Repair Materials Specification B.493642A.B.C.D.
Table 801

(j) Visually inspect the crimped areas, then secure the cable to its original cable run or loom with the previously used securing clamps and lacing.

(k) Subject the repaired cable length to electrical checks.

B. Repair B.493642B.

NOTE: This is an alternative to repair B.493642A and introduces a shrink sleeve in place of a crimped sleeve, to restore the cable insulation.

(1) Limitations.

(a) This repair to be confined to cables with damaged insulation not exceeding 0.600 in. (15,24 mm) in length and where there is sufficient room in the area of damage to operate the necessary tools to effect the repair.

(b) Ensure that the splice positions do not coincide with a loop clamp position.

(c) The repair is to comply with the layout in Figure 802.

(d) Use only materials specified in Table 801.

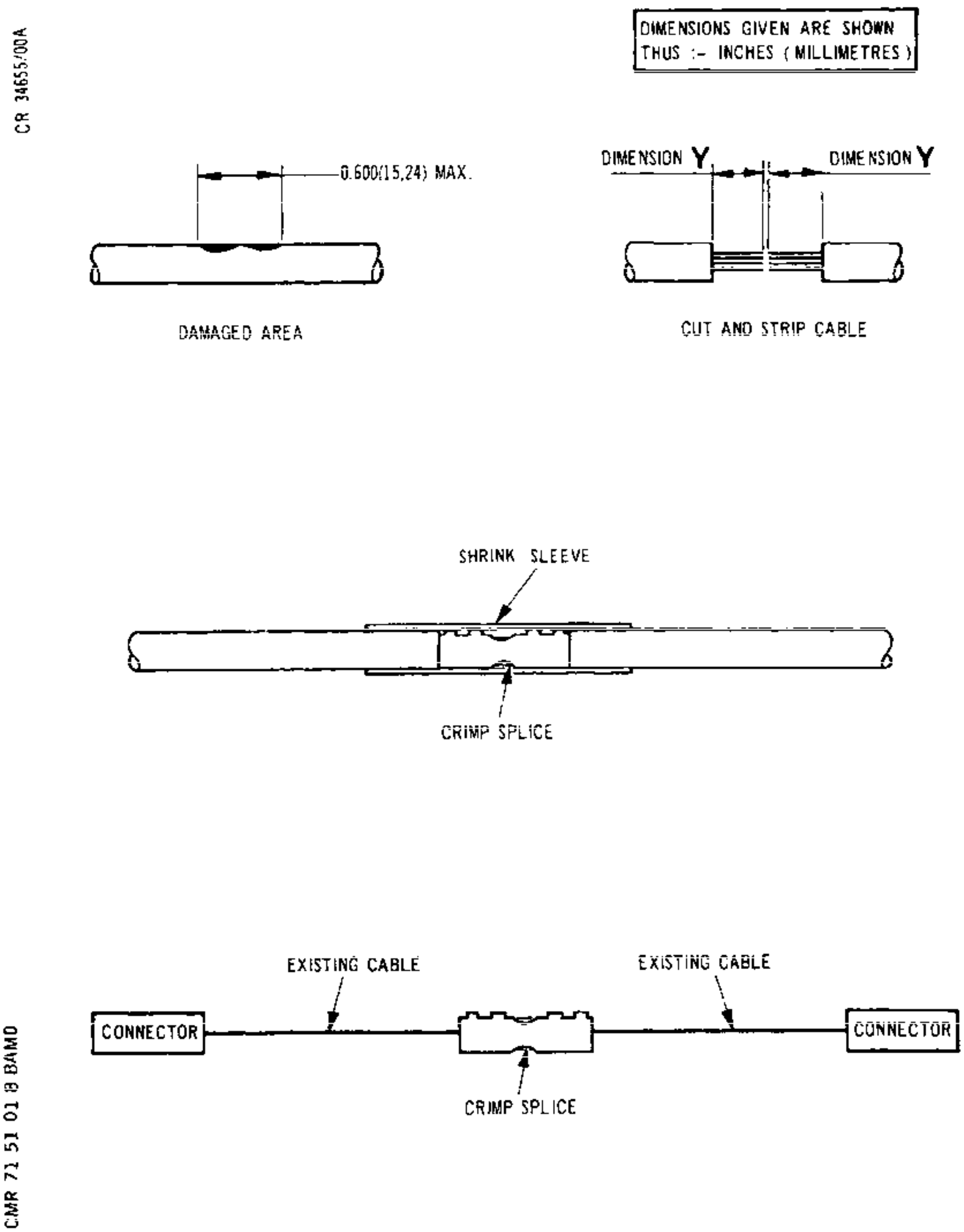
(2) Procedure.

(a) Cut, strip and inspect the cable as detailed in para.3A. (2) (a) to (d) but refer to Figure 802.

(b) Select, from the splice kit (Table 801), the correct size shrink sleeve and position it over one end of the cable at a neutral position, near to the repair area.

(c) Select the appropriate single post insulated butt splice from the splice kit (Table 801), then insert the conductor cable ends in the butt splice.

(d) With the conductors abutting at the central indentation of the insulated butt splice, crimp the splice over the conductor cable using the correct crimping tool selected from



Single Core Size 20 and Size 16 Cables
Layout of Repair B.493642B
Figure 802

Table 801.

(e) Position the shrink sleeve centrally over the repair area and the core splice as shown in Figure 802, then apply the heat shrink procedure to the PTFE sleeve. For heat shrinking instructions of PTFE sleeves refer to para.8.B.

(f) Visually inspect the repaired areas, then secure the cable to its original cable run or loom with the previously used securing clamps and lacing.

(g) Subject the repaired cable length to electrical checks.

C. Repair B.493642C.

NOTE: This repair is complementary to B.493642A and B and is implemented when damage to the insulation is close to a replaceable cable termination, reference Figure 803. The limitation reference para.2.A.(5) must be adhered to when the cable termination is at one of the main break connectors.

(1) Limitations.

(a) Ensure that the position of the splice location does not coincide with a loop clamp position.

(2) Procedure.

(a) Withdraw the cable end from the termination point.

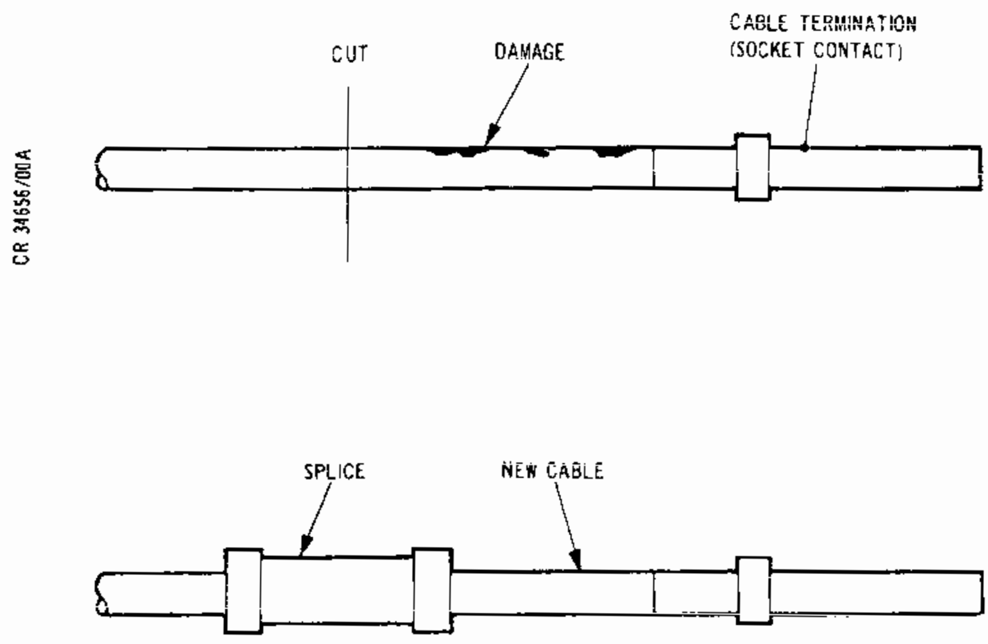
(b) Cut the cable at a position beyond the damaged portion, then prepare the cable for fitment of a single post insulated butt splice as described for repair B.493642A. or B.

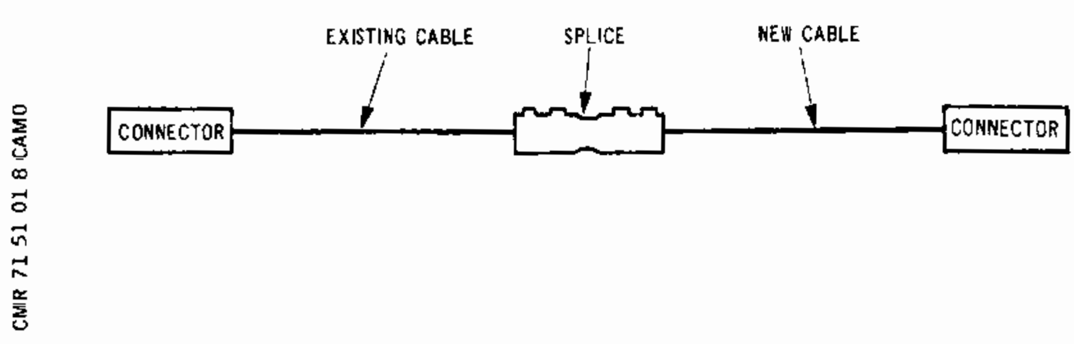
(c) Select a new length of cable and attach the appropriate termination point connector.

(d) Complete the splice connection at the new splice point in accordance with repair B.493642A. or B.

(e) Visually inspect the repaired area, then reinstall the cable in the harness and secure with the lacing and clamps used prior to this repair.

(f) Subject the repaired cable length to electrical





Single Core Size 20 and Size 16 Cables
Layout of Repair 493642C
Figure 803

checks.

D. Repair B.493642D.

NOTE: This repair is complementary to repairs B.493642A and B and is implemented where the damaged area is located in the middle of a cable run, or isolated from a convenient termination point (Ref. Fig. 804).

(1) Limitations.

(a) Ensure that the position of the splice locations do not coincide with loop clamp positions.

(b) Where more than one cable has been damaged splices must be staggered.

(c) No more than two splice connectors are to be used in any one length of cable.

(2) Procedure.

(a) Cut out the damaged section of the cable at a convenient point either side of the damaged area, and where the tools necessary to effect the repair can be operated.

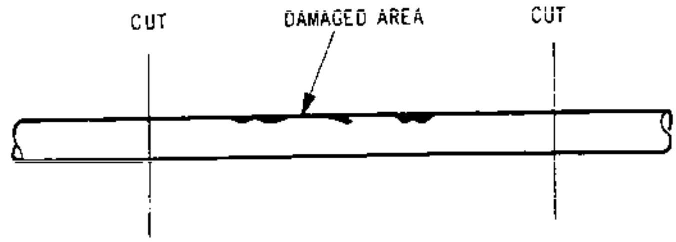
(b) Splice in a new section of suitable length cable, using two single post insulated butt splices and crimp or shrink sleeve the outer insulation as described for repairs B.493642A. or B.

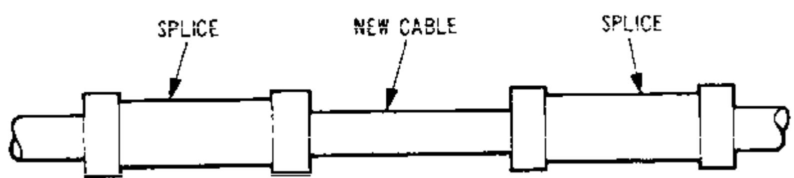
(c) Visually inspect the repaired area, then secure the cable run to the cable loom, attach the cable using all the relevant lacing and loop clamps; ensure that the new splice is laced into the cable loom.

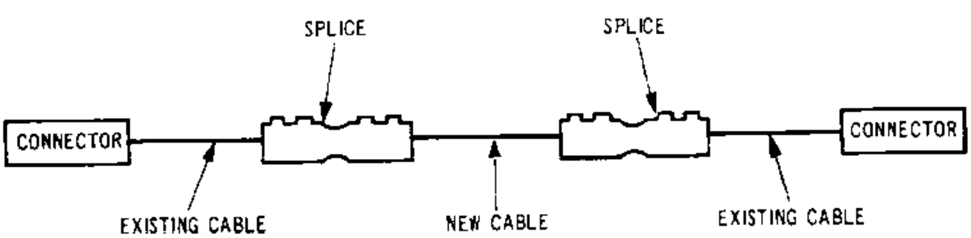
(d) Subject the repaired cable length to electrical checks.

4. Repair Single or Multicore Size 20 and Size 16 Cables Screened and Jacketed

WARNING: HEALTH HAZARD. MATERIALS USED IN THESE REPAIRS ARE COMPOSED OF POLYTETRAFLUOROETHYLENE (PTFE). THIS MATERIAL WILL EMIT TOXIC GASES WHEN SUBJECTED TO TEMPERATURES ABOVE 340 DEF C, THE HIGHER THE TEMPERATURE THE GREATER THE EMISSION OF TOXIC GAS.







Single Core Size 20 and 16 Cables Layout
of Repair B.493642D
Figure 804

ADEQAUTE VENTILATION IS TO BE PROVIDED WITHIN THE WORK AREA AND CLOSE TO THE HEATING SOURCE.

A. Repair B.493642E.

NOTE: This repair is to be implemented where the damage is confined to the cable outer jacket, and is achieved by wrapping the damaged area with a suitable PTFE tape (Ref. Fig. 805).

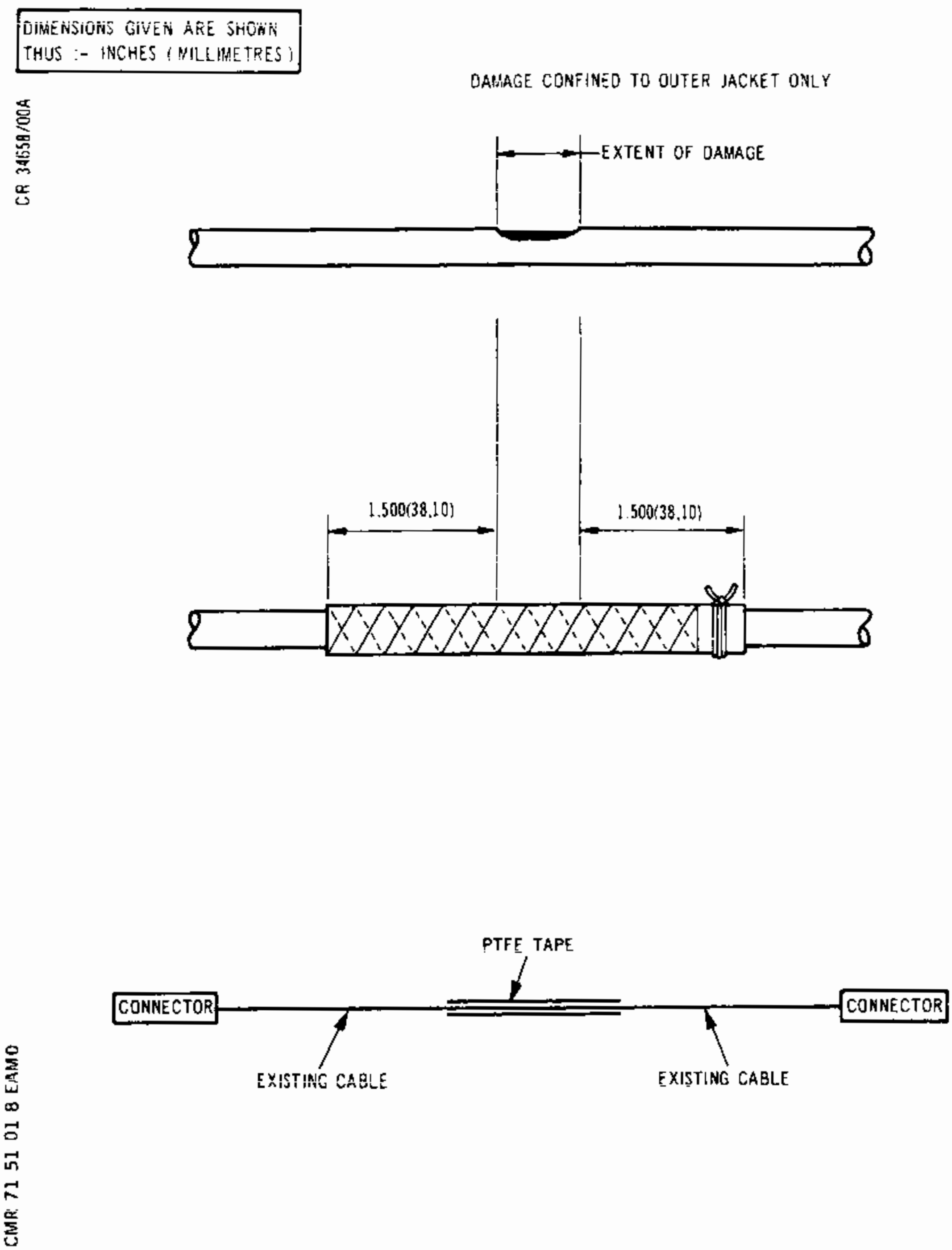
(1) Limitations.

(a) Ensure that the damage is confined to the outer jacket.

(2) Procedure.

(a) Obtain a single length of PTFE sealing tape (Ref. Table 802) of sufficient length to carry out operations (b) and (c).

(b) Commencing at a point approximately 1.50 in. (38,10 mm) from the damaged area, wrap the tape around the cable using a 50 per cent overlap of the PTFE tape to a point approximately 1.50 in. (38,10 mm) beyond the damaged area.



Single Core Size 20 and Size 16 Cables
Layout of Repair B.493642E
Figure 805

Cable Size	Splice Kit Ref.	Shrink Sleeve	Dimension Y	Crimp Tool
20	Raychem Kit W-096-01	-	0.32 - 0.34 in. (8,0 - 8,7 mm)	Raychem AD 1377
	Raychem Kit W-096-02	-	0.32 - 0.34 in. (8,0 - 8,7 mm)	Raychem AD 1377
	AMP 2-326745-1	Raychem W-053-13	0.22 - 0.24 in. (5,5 - 6,0 mm)	AMP 46467
	AMP 322822	Raychem W-053-13	0.22 - 0.24 in. (5,5 - 6,0 mm)	AMP 46447
16	Raychem Kit W-096-02	-	0.32 - 0.34 in. (8,0 - 8,7 mm)	Raychem AD 1377
	AMP 322822	Raychem W-053-13	0.22 - 0.24 in. (5,5 - 6,0 mm)	AMP 46447

FOR REPAIRING CABLE SCREEN AND JACKETS

SCREEN BRAID	STRIP AND USE BRAID FROM NEW CABLE OF SAME TYPE.
SHRINK SLEEVE	RAYCHEM TFE SIZE 6 FOR CABLE UP TO 0.150 IN. (3,810 MM) O/DIA. RAYCHEM TFE SIZE 2 FOR CABLE 0.150 IN. - 0.250 IN. (6,350 MM) O/DIA.
SOLDER SLEEVE	RAYCHEM W-021-00 FOR CABLE UP TO 0.150 IN. (3,810 MM) O/DIA. RAYCHEM W-021-02 FOR CABLE 0.150 IN. - 0.250 IN. (6,350 MM) O/DIA.
GLASS CLOTH TAPE	SCOTCH - TYPE 69 OR CXLP 1.000 IN. (25,0 MM) WIDE.
PTFE SEALING TAPE	B.427935
LACING BRAID	TYGADURE T085
SEALANT	SILICONE VARNISH MS 996.

Repair Material Specification Schemes B.493642E.F.G.H. and J
Table 802

(c) Without a break in the tape, wrap in the reverse direction, maintaining the 50 per cent overlap, to completely cover the first wrap and finish neatly at the starting point.

(d) Secure the end of the PTFE sealing tape using lacing braid (Ref. Table 802) with clove hitch and reef knot. Seal the knot with Silicone varnish.

(e) Visually inspect the repaired area, then secure the cable into the cable loom and cable run using the relevant lacing and clamp loops.

(f) Subject the repaired length to electrical checks.

B. Repair B.493642F.

NOTE: This repair is to be implemented where both the outer jacket and screen is damaged, provided that the screen function is not seriously impaired, and not more than 50 per cent of the braid strands are broken (Ref. Fig. 806).

(1) Limitations.

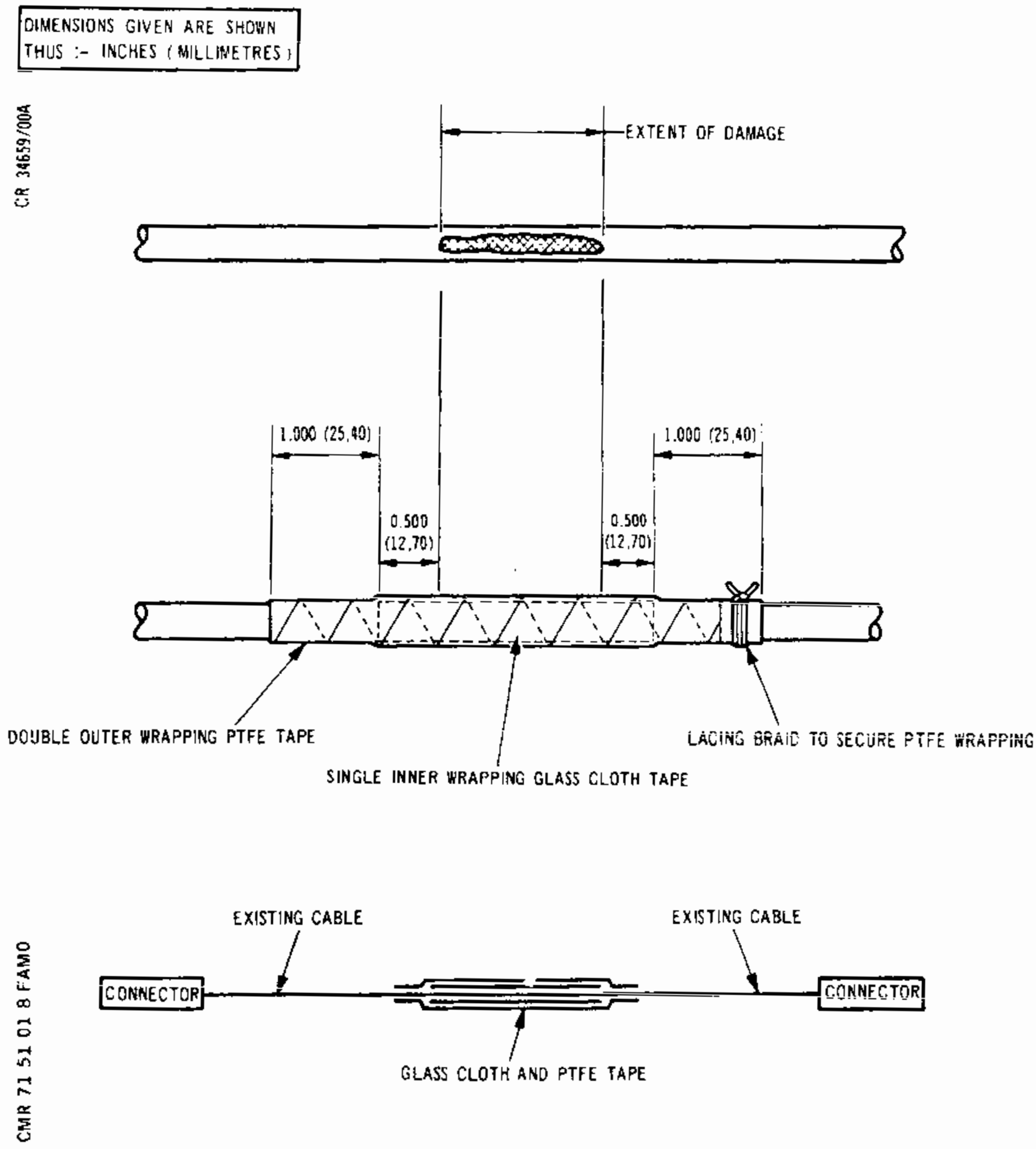
(a) Ensure that the damage is limited to the outer jacket and screen braiding only.

(2) Procedure.

(a) Comb out and re-lay the damaged screen braid, to cover the maximum area of the exposed cable; curl the braid strand ends outwards to avoid penetration of the core insulation.

(b) Starting at a point approximately 0.500 in. (12,70 mm) from one end of the damaged area and using glass cloth tape (Ref. Table 802), wrap the cable to a point approximately 0.500 in. (12,70 mm) beyond the other end of the damaged area. Maintain a 50 per cent overlap of the tape width during the wrapping.

(c) Commencing at a point approximately 1.00 in. (25,00 mm) from the edge of the glass cloth tape and using PTFE tape (Ref. Table 802), wrap the cable and the glass cloth tape; maintain a 50 per cent overlap to a point approximately 1.00 in. (25,00 mm) beyond the far edge of the glass cloth tape. Without a break in the tape,



Single or Multicore Size 20 and 16 Cables
Screened and Jacketed Repair Layout B.493642F
Figure 806

wrap in the reverse direction maintaining the 50 per cent overlap and finish neatly at the starting point.

(d) Secure the end of the PTFE tape using lacing braid (Ref. Table 802) with clove hitch and a reef knot, seal the knot with Silicone varnish.

(e) Visually inspect the repaired area, then secure cable into the cable loom and cable run using the relevant lacing and clamp loops.

(f) Subject the repaired cable length to electrical checks.

C. Repair B.493642G.

NOTE: This repair is to be implemented to screened and jacketed cables where damage to the core insulation does not exceed 0.600 in (15,24 mm) in length in any one cable core, and where there is sufficient room in the area of damage to operate the necessary tools to effect the repair.

(1) Limitations.

(a) Multicore cable splices are to be staggered by twice the splice length.

(b) Not more than two splices to be installed in any one cable core.

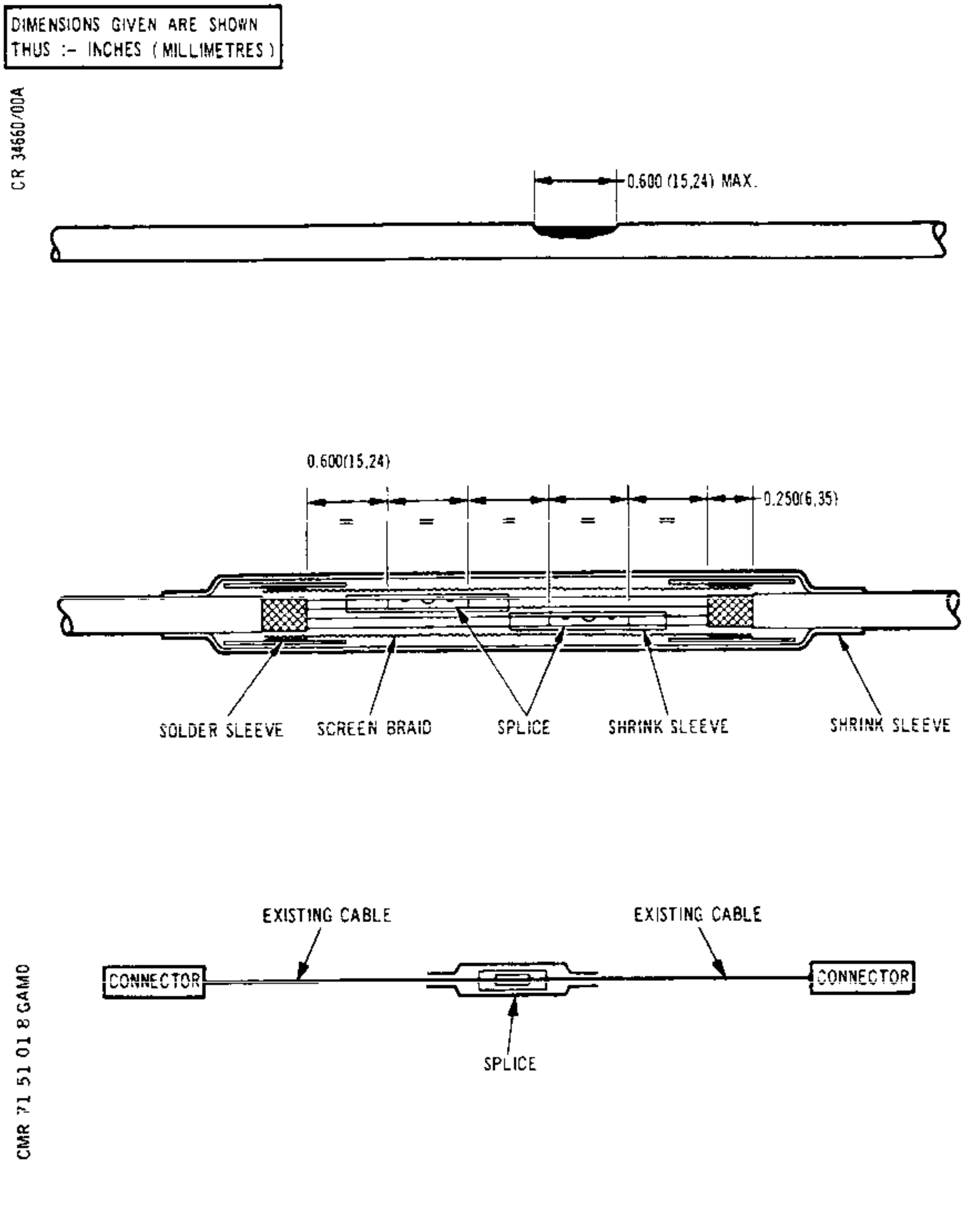
(c) Ensure that the repair area does not coincide with a loop clamp position.

(2) Procedure.

(a) Cut away sufficient outer jacket insulation to expose 3.50 in (87,5 mm) of the screen braid, then remove 3.00 in (75 mm) of the screen braid; leaving approximately 0.25 in. (6,25 mm) of braid protruding from each end of the insulation at the extremes of the repair area; refer to Figure 807 for repair detail and dimensions.

(b) Cut through the cable cores at their appropriate staggered positions.

(c) Locate a length of correct size shrink sleeve over the cable followed by two correct size solder sleeves and a suitable length of axially



Single or Multicore Size 20 and 16 Cables
Screened and Jacketed Repair Layout B.493642G
Figure 807

compressed screen braid (Ref. Table 802); position the parts at a convenient neutral point away from the cable repair area.

(d) Taking each cable end in turn and using a suitable stripping tool, strip the cable ends to expose sufficient of the conductor to accommodate the butt splices; refer to para.8.A. for cable stripping instructions.

(e) Locate on the cores, at the longest exposed sections, the correct size shrink sleeves.

(f) Select the appropriate butt splice and crimp tool from Table 802, then insert conductor ends in the butt splice.

(g) With the conductors abutting at the central indentation of the splices, crimp the splices over the conductors using the correct crimp tool.

(h) Position the shrink sleeves centrally over the splice connectors and shrink into position; refer to para.8.B. for the heat shrink techniques.

(j) Position the length of screen braid centrally over the repair area; ensure that the 0.25 in. (6,35 mm) overlap at the braid ends is maintained and that the bare ends of the braid are turned outwards, avoiding penetration of the core insulation.

(k) Locate the solder sleeves over the 0.25 in. (6,35 mm) cable braiding, at both ends of the repair area (Ref. Fig. 807), then trim off any excess braid, and finally solder into position; refer to para.8.C. for soldering details.

(l) When both ends of the braided cable have been soldered satisfactorily, position the shrink sleeve over the repair and shrink into position; refer to para.8.B. for the heat shrink techniques.

(m) Visually inspect the repaired area, then secure the cable to its original cable run or bunch with the previously used securing clips and lacing. Ensure that the spliced area does not coincide with a loop clamp position.

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(n) Subject the repaired cable length to electrical checks.

D. Repair B.493642G (alternative).

NOTE: This repair is implemented as an alternative repair to that quoted in para.C. This repair permits the operator to use a PTFE tape wrapping in place of shrink sleeve at the cable outer insulation. Observe the Note and limitations at the commencement of para.C.

(1) Procedure.

(a) Carry out operations (a), (b) and (d) detailed in para.C, but with reference to Figure 808.

(b) Locate on the cable two correct size solder sleeves and a suitable length of axially compressed screen braid; position the parts at a convenient neutral point away from the cable repair area.

(c) Carry out operations (e), (f), (h), (j) and (k) detailed in para.C.

(d) Commencing approximately 1 in. (25,4 mm) from one end of the repair area, and using PTFE tape (Ref. Table 802), wrap the cable and repair area and continue for approximately 1 in. (25,4 mm) beyond the repair area. Maintain a 50 per cent overlap of the tape during the wrapping. Without a break in the tape, wrap in the reverse direction maintaining the 50 per cent tape overlap, and finish neatly at the starting point.

(e) Secure the end of the PTFE tape using lacing braid (Ref. Table 802) with clove hitch and reef knots; seal the knot with Silicone varnish.

(f) Visually inspect the repaired area, then secure the cable to its original cable run or loom with the previously used securing clamps and lacing.

(g) Subject the repaired cable length to electrical checks.

E. Repair B.493642H.

NOTE: This repair is to be implementted on screened and

DIMENSIONS GIVEN ARE SHOWN
THUS :- INCHES (MILLIMETRES)

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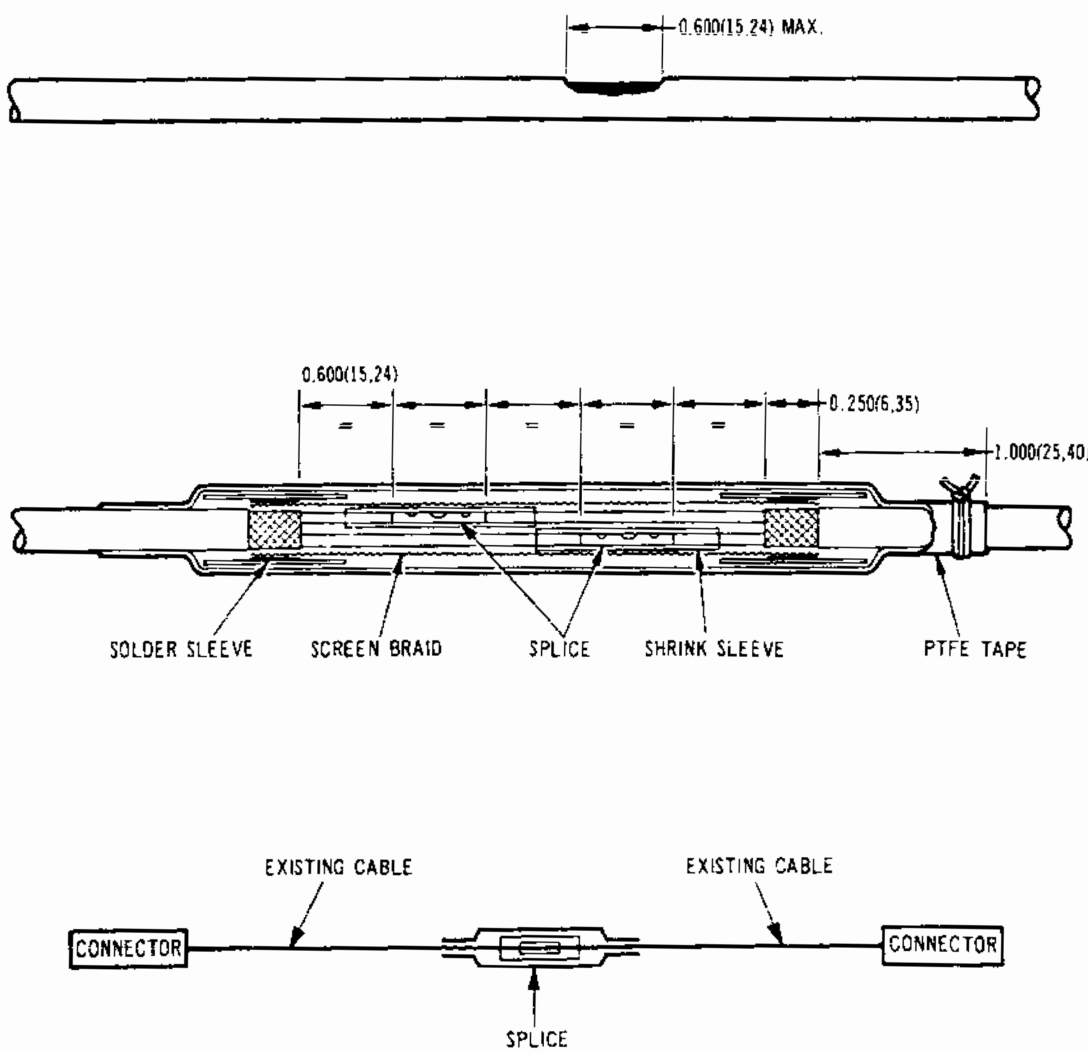

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Single/Multicore Size 20/16 Cables Screened/
Jacketed Repair Layout B.493642G, Alternative
Figure 808

jacketed cables where extensive damage has been sustained close to a replaceable termination, and where there is sufficient room in the area of damage to operate the necessary tools to effect the repair; refer to Figure 809 for repair layout and Table 802 for suitable materials.

(1) Limitations.

(a) Not more than two splices to be installed in any one cable core.

(b) Multicore cable splices are to be staggered by twice the splice length.

(c) Ensure that the intended splice location at the end of the in situ cable does not coincide with a clamp loop position.

(2) Procedure.

(a) Withdraw the cable end from the termination point.

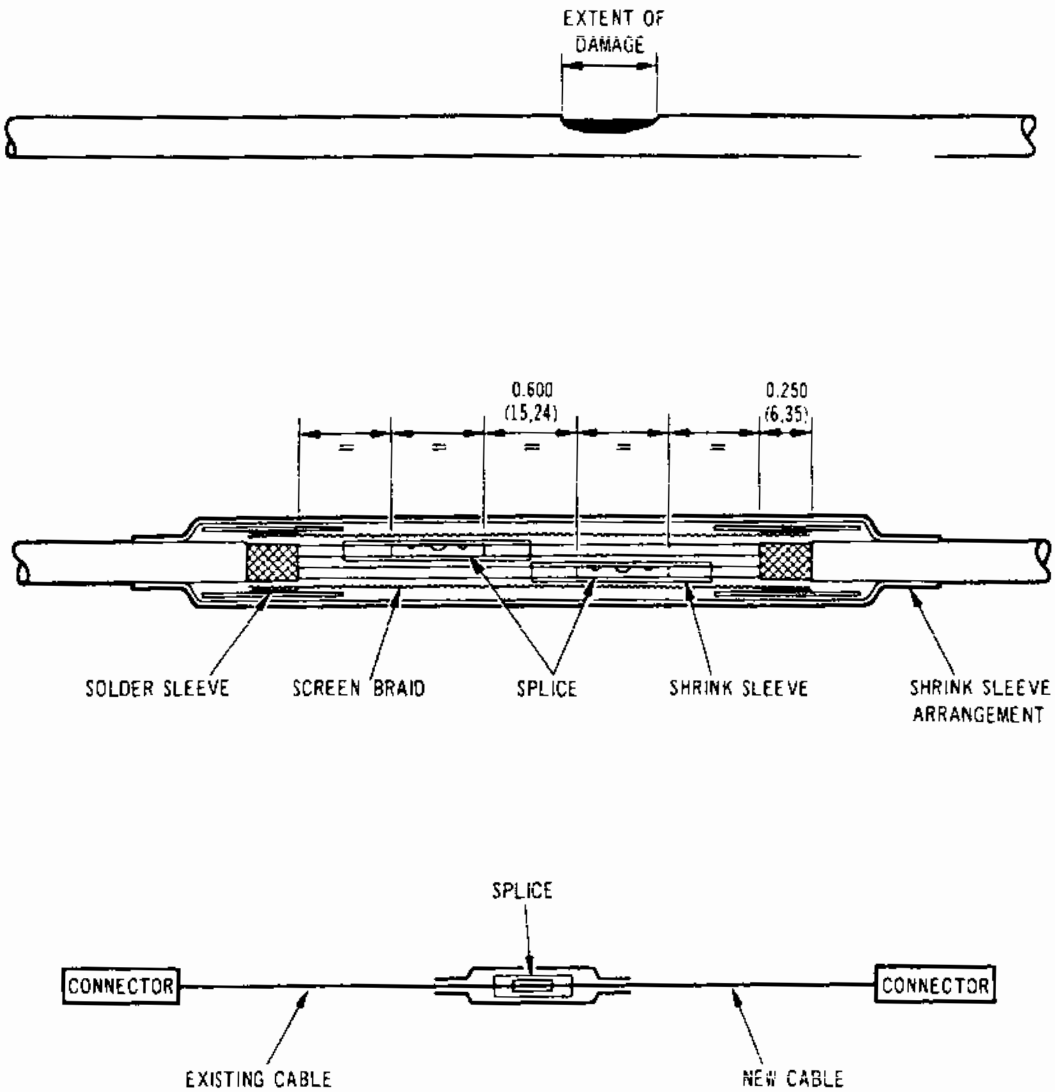
(b) Cut the cable at the furthermost side of the damaged area from the termination point, so that the damaged section os removed with the length of cable previously disconnected from the termination point; use conventional electrical wire cutters.

(c) Cut away sufficient outer jacket insulation and screen braid from the end of the in situ length of cable; this is to accommodate the stripping of the conductor core(s) and the staggered length of cable for the butt splice(s) in a subsequent operation. Leave approximately 0.25 in. (6,35 mm) of screen braid protruding from beneath the outer jacket insulation.

(d) Select a new length of replacement cable, prepare one end to accommodate the fittings required for attachment to the termination point, i.e. pins, socket contacts, etc. then attach the prepared end to the termination point.

(e) Prepare the conductor core insulation and cable cores for attachment of the butt splice connectors; use the stripping tool and stripping tool instructions detailed in para.8.A.

DIMENSIONS GIVEN ARE SHOWN THUS :- INCHES (MILLIMETRES)



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Single or Multicore Size 20 and 16 Cables
Screened and Jacketed Repair Layout B.493642H
Figure 809

NOTE: Ensure when cutting multicore cable core(s), that allowance has been made for the staggered positions of the butt splice(s), then cut the cable core conductors to accommodate the butt splice(s).

(f) Locate on the cable the correct size shrink sleeve, two correct size solder sleeves and a suitable length of axially compressed screen braid; position the parts at a convenient neutral point away from the cable repair area.

NOTE: The shrink sleeve is only to be used if alternative PTFE wrap (para.F) is not used.

(g) Locate on the core(s) the correct size core shrink sleeve(s).

(h) Select the appropriate butt splice(s) and crimp tool, then insert conductor ends in the butt splice(s).

(j) With the conductors abutting at the central indentations of the butt splice(s), crimp the correct crimp tool.

(k) Carry out operations (h) to (l) as detailed in para.C.

(l) Visually inspect the repaired area, then secure the cable to its original cable run or loom with the previously used securing clips and lacing.

(m) Subject the repaired cable length to electrical checks.

F. Repair B.493642H (Alternative).

NOTE: This is an alternative to Repair B.493642H and permits the use of PTFE tape wrapping in place of the shrink sleeve at the cable outer insulation; refer to Figure 810 for the repair layout and to Table 802 for the materials. Observe the limitations in para.E.

(1) Procedure.

(a) Carry out operations (a) to (k) detailed in para.E, but omit reference to the assembling

and soldering of the outer shrink sleeve.

(b) Commencing approximately 1.0 in. (25,4 mm) from one end of the repair area, and using PTFE tape, wrap the cable and repair area and continue for approximately 1.0 in. (25,4 mm) beyond the repair area. Maintain a 50 per cent overlap of the PTFE tape during the wrapping. Without a break in the tape, wrap in the reverse direction maintaining the 50 per cent tape overlap, and finish neatly at the starting point.

(c) Secure the end of the PTFE tape using lacing braid with clove hitch and reef knot; seal the knot with Silicone varnish.

(d) Visually inspect the repaired area, then secure the cable to its original cable run or loom with the previously used securing clips and lacing.

(e) Subject the repaired cable length to electrical checks.

G. Repair B.493642J.

NOTE: This repair is implemented on screened and jacketed cables, where damage cannot be rectified using repair B.493642H (para. E or F) and where the damaged sustained in the cable run is not convenient to a termination point (Ref. Fig. 811).

(1) Limitations.

(a) Not more than two splices to be installed in any one cable core.

(b) Multicore cable splices are to be staggered by twice the splice length.

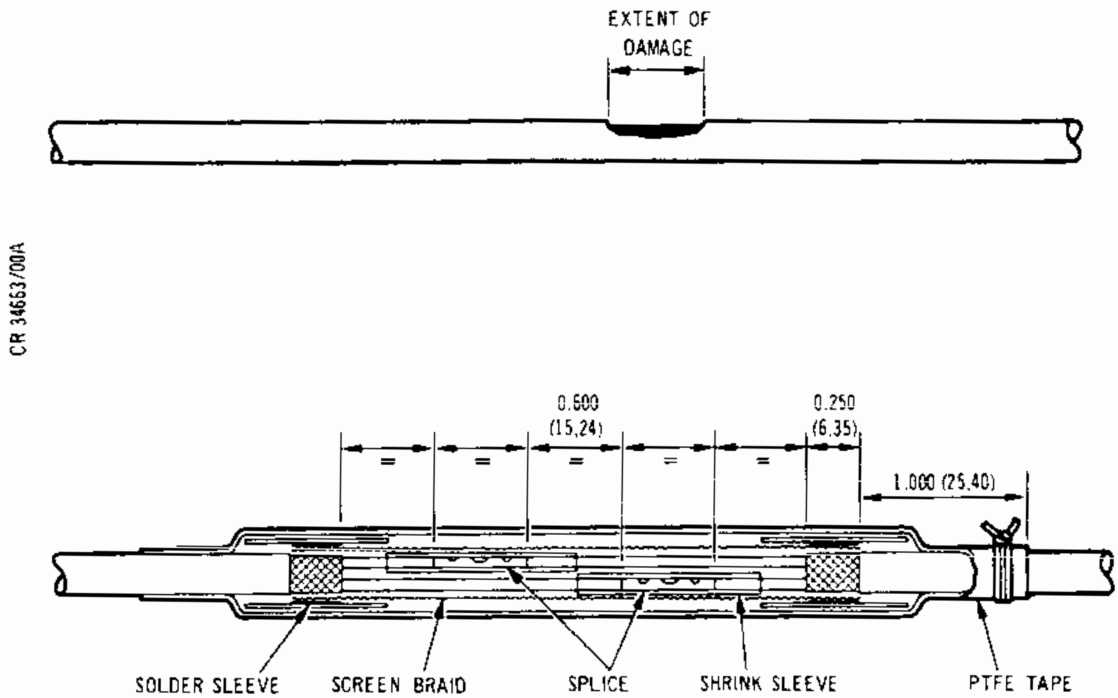
(2) Procedure.

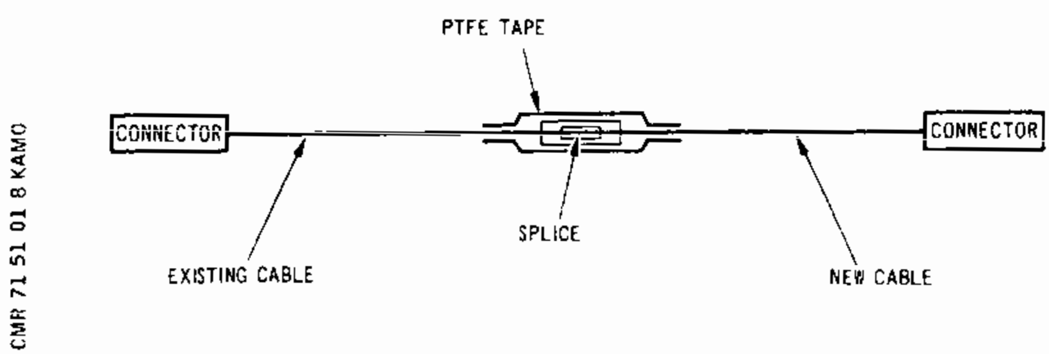
(a) Cut out the damaged length of cable at convenient points either side of the damaged area.

(b) Adopting the method of attachment used in repair B.493642H or its alternative, introduce a length of new cable between the in situ cable ends, using a butt splice connection at both ends of the new cable length.

(c) Visually inspect the repaired area, then secure

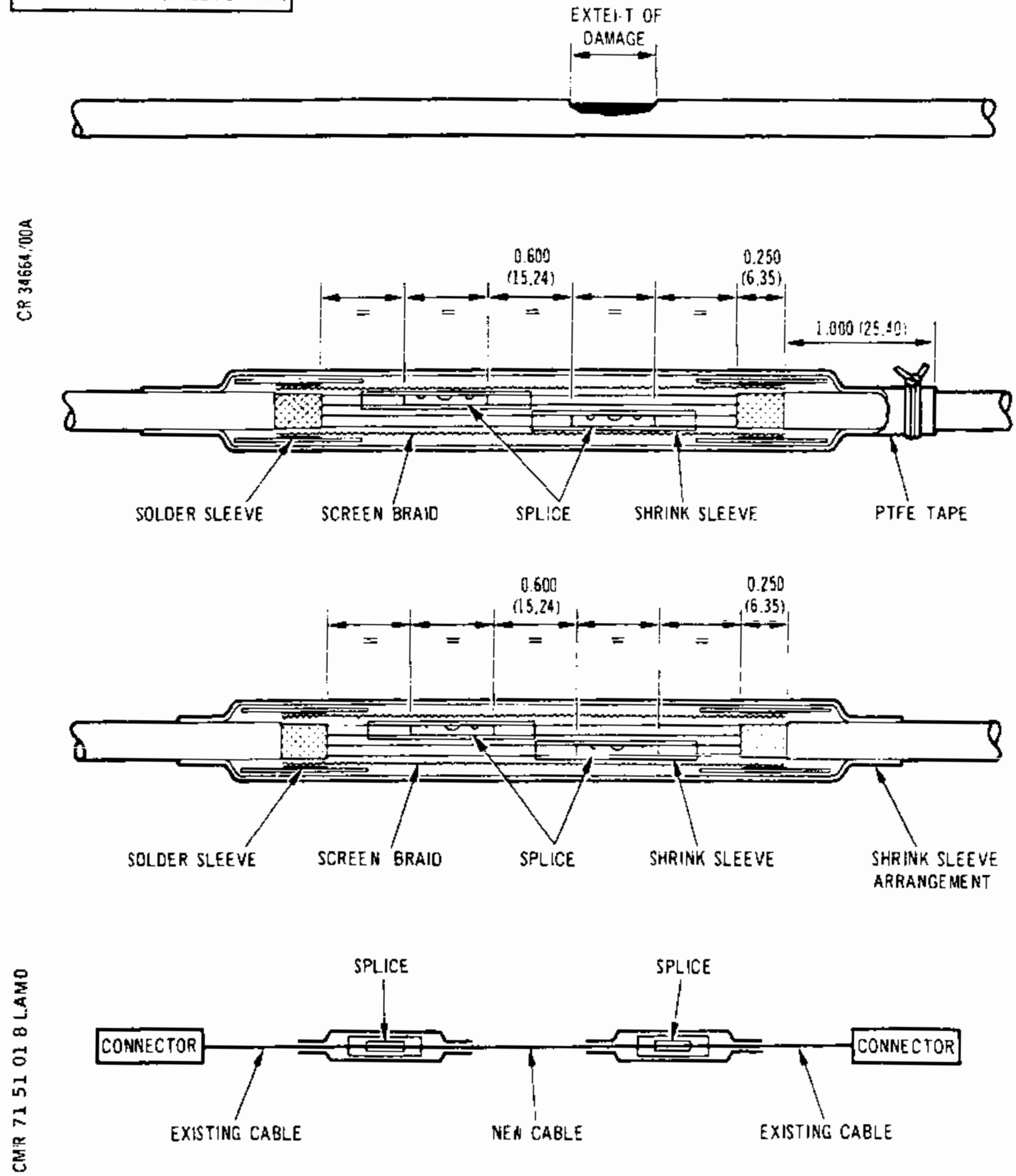
DIMENSIONS GIVEN ARE SHOWN THUS :- INCHES (MILLIMETRES)





Single/Multicore Size 20/16 Cables Screened/ Jacketed Alternative Repair Layout B.493642H, Figure 810

DIMENSIONS GIVEN ARE SHOWN THUS :– INCHES (MILLIMETRES)



Single or Multicore Size 20 and 16 Cables
Screened and jacketed Repair Layout B.493642J
Figure 811

the cable to its original cable run or loom with the previously used securing clamps and lacing.

(d) Subject the repaired cable length to electrical checks.

5. Repair Low Noise Cable, Screened and Jacketed

A. Repair B.493642K.

NOTE: This repair is implemented to low noise cables screened and jacketed, where the damage is confined to the outer jacket only; refer to Figure 812 for the repair layout and Table 803 for suitable materials.

(1) Procedure.

(a) Remove all debris from the damaged area, then ensure that the damage is confined to the outer jacket, and that the materials beneath the outer jacket are free from damage.

(b) Using the appropriate PTFE tape, and commencing 1.500 in. (38,1 mm) to one side of the damaged area, firmly wrap the 1.500 in. (38,1 mm) area of insulation, the damage section, and the insulation 1.500 in. (38,1 mm) beyond the other side of the damage. Maintain a 50 per cent overlap of the tape during the wrapping.

(c) Without a break in the tape wrap in the reverse direction until the first wrap is completely covered, maintaining the 50 per cent overlap, and finish neatly at the starting point.

(d) Secure the tape using lacing braid with a clove hitch and reef knot; seal the knot with Silicone varnish.

Material	Type
PTFE Sealing Tape	B.427935
Lacing Braid	TYGADURE TO85

Material	Type
Sealant	Silicone Varnish MS 996

Repair Material Specifications Repair B.493642K and B.493642N
Table 803

(e) Visually inspect the repaired are, then secure the cable to its original cable run or loom with the previously used securing clamps and lacing.

(f) Subject the repaired cable length to electrical checks.

6. Repair Single or Multicore Fireproof Cable Screened and Jacketed

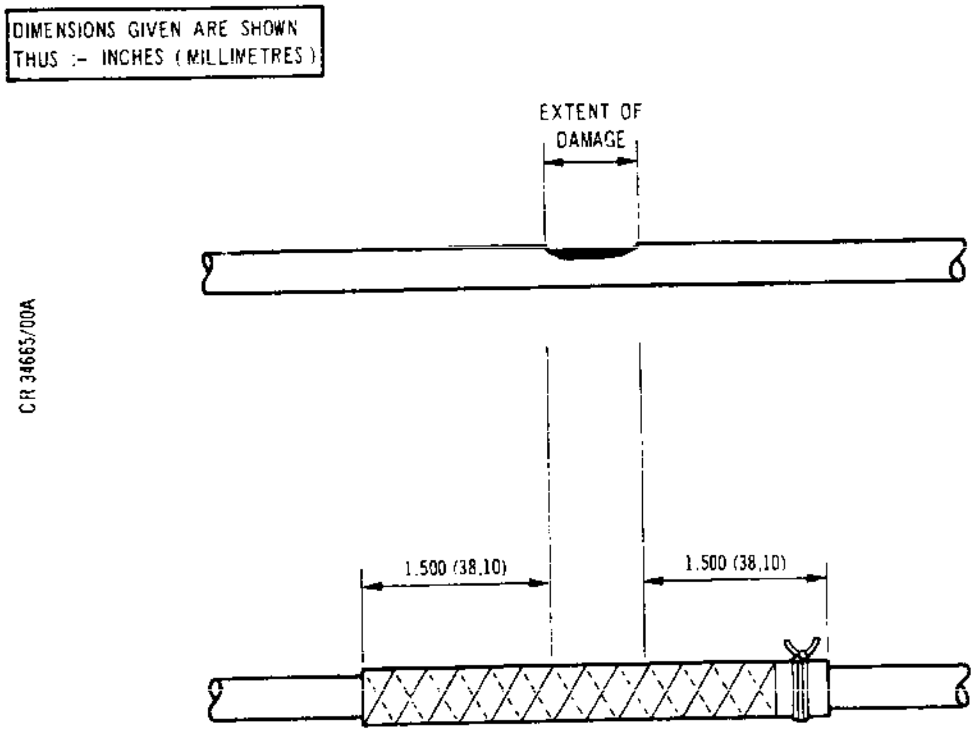
A. Repair B.493642L.

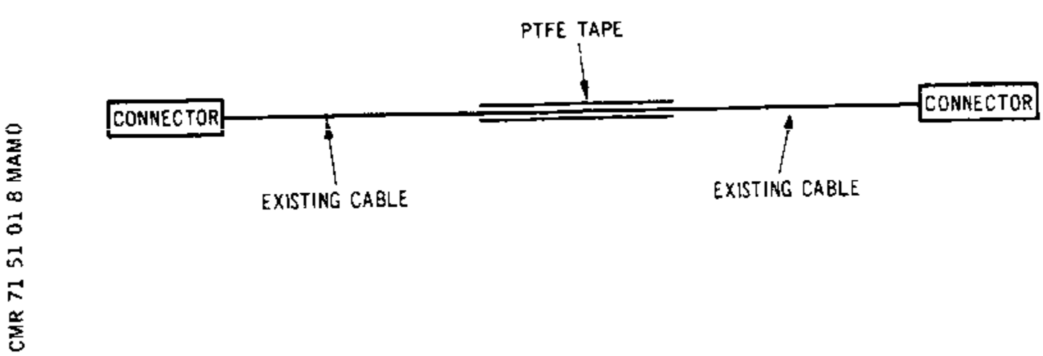
NOTE: This repair is implemented on single or multicore fireproof screened and jacketed cables, where the damage is confined to the outer jacket only; refer to Figure 813 for the repair layout and Table 804 for suitable materials.

(1) Procedure.

(a) Remove all debris from the damaged area, then ensure that the damage is confined to the outer jacket, and that the materials beneath the outer jacket are free from damage.

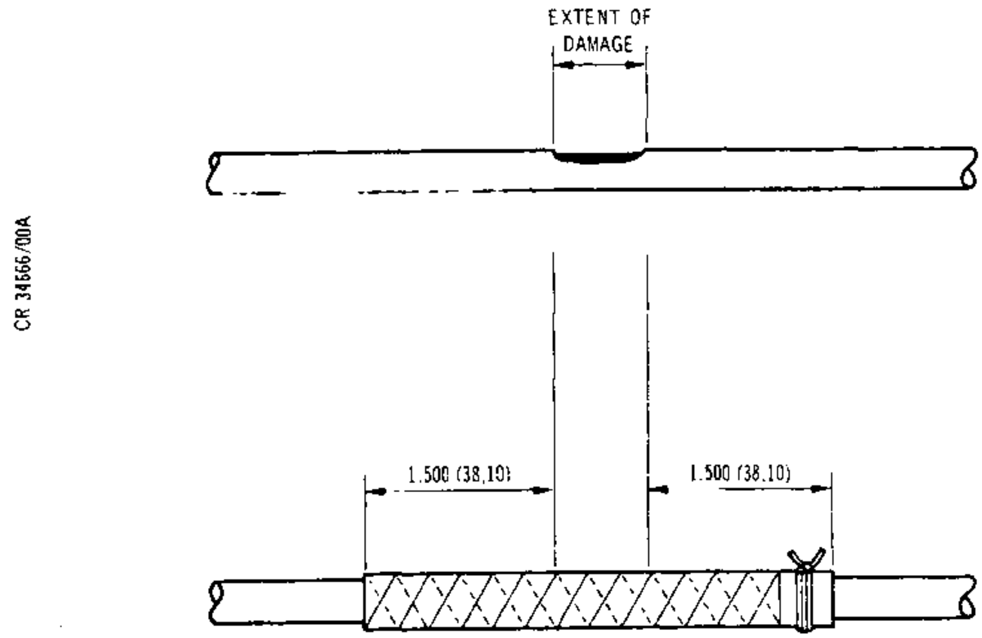
(b) Using the appropriate PTFE tape, and commencing 1.500 in. (38,1 mm) to one side of the damaged area, firmly wrap the 1.500 in. (38,1 mm) area of insulation, the damage section, and the insulation 1.500 in (38,1 mm) beyond the other side of the damage. Maintain a 50 per cent overlap of the tape during the wrapping.

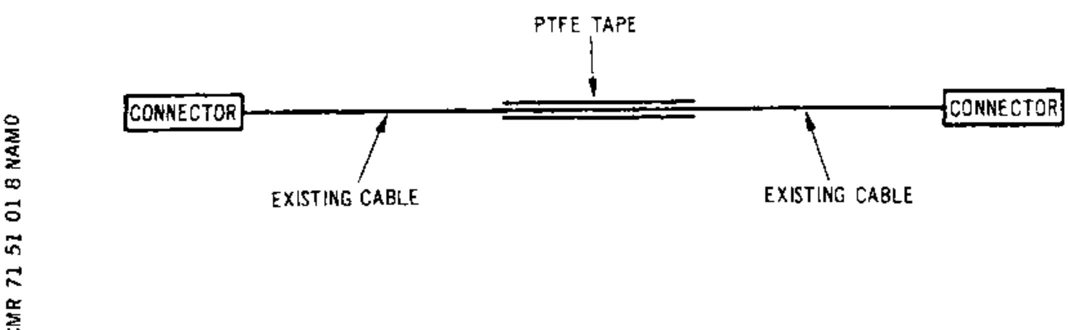




Low Noise Cables Screened and Jacketed
Layout of Repair B.493642K
Figure 812

DIMENSIONS GIVEN ARE SHOWN THUS :- INCHES (MILLIMETRES)





Single or Multicore Fireproof Cables Screened
and Jacketed Layout of Repair B.493642L
Figure 813

Material	Type
* Glass Cloth Tape	SCOTCH - TYPE 69 or CXLP 1.000 in. (25,0 mm) wide
PTFE Sealing Tape	B.427935
Lacing Braid	TYGADURE T085
Sealant	Silicone Varnish MS 996
* Applicable to Repair B.493642M only	

Repair Material Specifications Repair B.493642L.M.N
Table 804

(c) Without a break in the tape wrap in the reverse direction until the first wrap is completely covered, maintaining the 50 per cent overlap, and finish neatly at the starting point.

(d) Secure the tape using lacing braid with a clove hitch and reef knot; seal the knot with Silicone varnish.

(e) Visually inspect the repaired area, then secure the cable to its original cable run or loom with the previously used securing clips and lacing.

(f) Subject the repaired cable length to electrical checks.

B. Repair B.493642M.

NOTE: This repair is implemented on single or multicore fireproof screened and jacketed cables, where both the outer jacket and screened sleeves are damaged, but the screen function is not seriously impaired, i.e., not more than 50 per cent of the braid strands being broken; refer to Figure 814 for the repair layout and Table 804 for suitable materials. If more extensive damage has been sustained the cable must be replaced.

(1) Procedure.

(a) Smooth out and re-lay the damaged screen braid to

cover the maximum area of exposed cable; curl the frayed ends away from the cable to avoid their penetration of the core insulation.

(b) Commencing at a point approximately 0.500 in. (12,70 mm) from the damaged area, wrap the cable with glass cloth tape, using a 50 per cent overlap of the cloth and continue to a point 0.500 in. (12,70 mm) beyond the damaged area.

(c) Using PTFE tape and commencing at a point approximately 1.000 in. (25,40 mm) from the glass cloth tape, firmly wrap the one inch area of insulation and the glass cloth tape, then continue the wrap to a point 1.000 in. (25,40 mm) over the insulation, beyond the other end of the glass cloth tape. Maintain a 50 per cent overlap of the tape during this operation.

(d) Without a break in the tape wrap in the reverse direction until the first wrap is completely covered, maintaining the 50 per cent overlap, and finish neatly at the starting point.

(e) Secure the tape using braid with a clove hitch and reef knot; seal the knot with Silicone varnish.

(f) Visually inspect the repaired area, then secure the cable to its original cable run or loom with the previously used securing clamps and lacing.

(g) Subject the repaired cable length to electrical checks.

7. <u>Repair Single Fireproof Cable Jacketed</u>

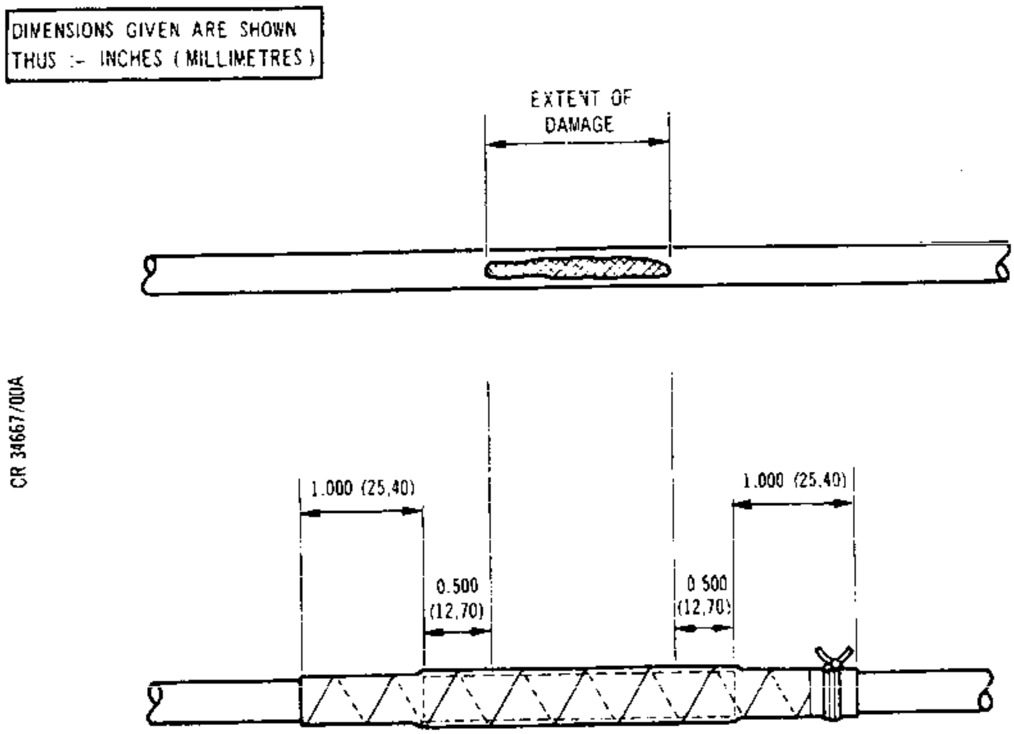
A. Repair B.493642N.

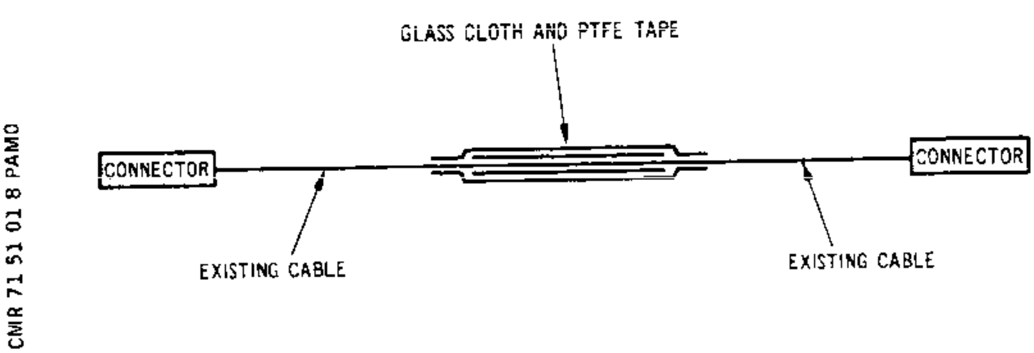
<u>NOTE</u>: This repair is implemented on single fireproof jacketed cables, where the damage is confined to the outer jacket; refer to Figure 815 for the repair layout and Table 805 for suitable materials.

(1) Procedure.

(a) Remove all debris from the damaged area, then ensure that the damage is limited only to the outer jacket.

(b) Using the appropriate PTFE tape, and commencing





Single or Multicore Fireproof Cables Screened
and Jacketed Layout of Repair B.493642M
Figure 814

1.500 in. (38,1 mm) to one side of the damaged area, firmly wrap the 1.500 in. (38,1 mm) area of insulation, the damaged section, and the insulation 1.500 in (38,1 mm) beyond the other side of the damage. Maintain a 50 per cent overlap of the tape during the wrapping.

(c) Without a break in the tape wrap in the reverse direction until the first wrap is completely covered maintaining the 50 per cent tape overlap, and finish neatly at the starting point.

(d) Secure the tape using lacing braid with a clove hitch and reef knot; seal the knot with Silicone varnish.

(e) Visually inspect the repaired area, then secure the cable to its original cable run or loom with the previously used securing clamps and lacing.

(f) Subject the repaired cable length to electrical checks.

8. Tools and Equipment

Tool Description	Type	Supplier	Ref. Fig.
Crimp tool	Raychem AD 1377	Raychem Ltd., Cheney Manor, Swindon, Wilts., England	
Raychem thermo-gun (110 volt)	C.V.1511-110 and PR13C reflector		
Raychem thermo-gun (110 volt)	C.V.1509-110 and PR25 reflector		
Crimp tool Crimp tool	AMP 46467 AMP 46447	A.M.P. Ltd. Terminal House, Stanmore, Middlesex, England	

Tool Description	Type	Supplier	Ref. Fig.
Stripping tool	Hellerman 15576	Hellerman Electrics, Crawley, Sussex, England	816

Tools and Equipment for Repairs B.493642A to N
Table 805

A. Hellerman Stripping Tool No.15576 Instructions (Read in Conjunction with Figure 816).

(1) General.

(a) The blade of the tool must not damage the conductor strands, such damage will cause premature failure.

(b) Ensure that the correct cam station of the tool is selected for the particular cable under repair.

(c) To rotate cam depress release handle. Pull adjustable cam section in direction of arrow. Rotate cam until the correct cam station is aligned with the end of the blade release.

(2) Adjustment.

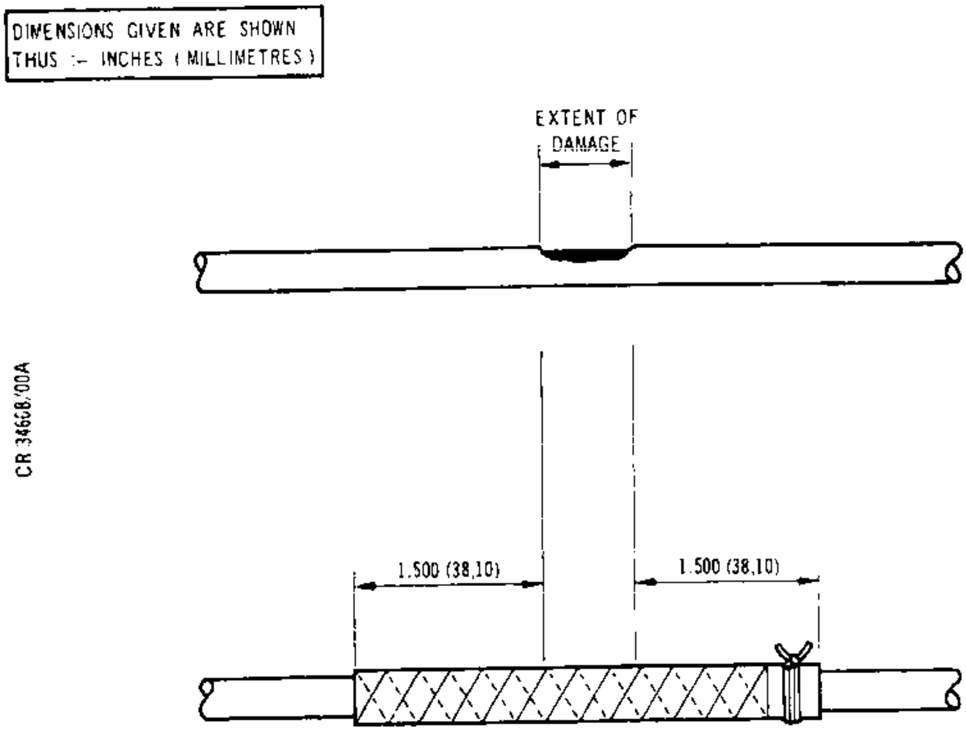
(a) Insert required bushing and retain in position with Allan screw.

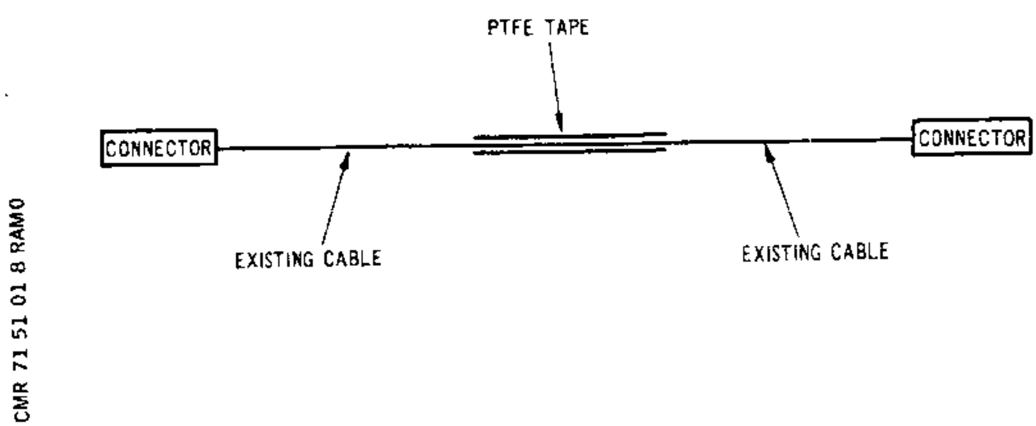
(b) Using a 6.00 in. (150,00 mm) sample length of cable and a sharp blade, expose approximately 0.500 in. (12,00 mm) of conductor.

(c) Insert the stripped end of the sample through the bush until the insulation touches the cutting blade.

(d) Adjust the cam screw situated under the end of the blade release, so that the cutting edge of the blade just clears the cable conductor, (rotate adjustable cam as necessary to obtain access).

(e) If more than 0.600 in. (15,24 mm) of insulation





Single Fireproof Jacketed Cable Layout
of Repair B.493642N
Figure 815

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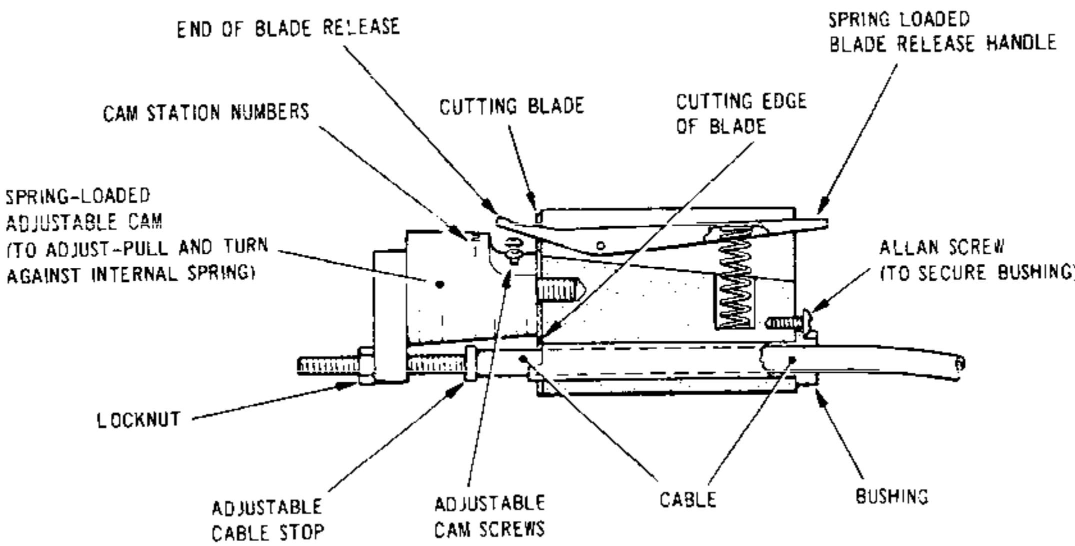

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Hellerman Stripping Tool No.15576
Figure 816

is to be stripped from the cable, the cable stop assembly must be removed and the length of insulation to be removed measured using a hand rule. When 0.600 in. (15,24 mm) or less of insulation is to be stripped from the cable adjust the cable stop to the required dimension, then tighten the locknut which secures the adjustable cable stop to the tool.

(f) Raise the blade by depressing the blade release handle and remove the sample length of cable from the tool.

(g) With the blade release handle depressed, insert the unstripped end of the sample cable length, through the bush to butt against the previously adjusted stop. When the adjustable cable stop has been removed, insert the cable to the required measured length.

(h) Free the blade release handle, then apply outward pressure to the release handle, to ensure that the end of the blade release remains in contact with the cam screw.

(j) Holding the cable rigid rotate the tool in excess of one revolution.

(k) Raise the blade and remove the sample length of cable from the tool.

(l) Separate the insulation at the cut by gently bending the cable. Remove the end insulation thereby exposing the conductor.

NOTE: Do not use the cutting blade to remove the insulation end.

(m) Examine the conductor strands for any damage caused by the blade; if necessary readjust the cam screw.

(n) When satisfactory removal of the insulation from the sample cable has been achieved and the condition of the cable conductor is acceptable, retain the tool settings and strip the engine cable requiring repair.

B. Heat Shrinkage Instruction.

WARNING: BEFORE USING THE HEAT SHRINKING PROCEDURE ENSURE

THAT ALL SAFETY PRECAUTIONS REGARDING VENTILATION OF THE WORK AREA ARE COMPLIED WITH, AND THAT A SUITABLE RAYCHEM THERMO-GUN TYPE CV.1509-110 OR CV.1511-110 WITH A PR24 or PR13C REFLECTOR IS USED. THE MINIMUM POWER REQUIREMENT OF THIS EQUIPMENT IS 900 WATTS.

(1) Set the heat gun to produce a minimum temperature of 380 deg C; a five minute warm-up period of the gun, prior to heat application at the sleeve is recommended.

(2) With the sleeve correctly positioned on the cable, direct the hot air onto the sleeve, until the PTFE becomes transparent and the sleeve has shrunk to a snug fit. Ensure that the hot air is applied to the entire circumference and length of the sleeve.

(3) As soon as the sleeve has become transparent and has shrunk into position, cease the application of hot air. Shrinkage normally occurs within 8-20 seconds but should not exceed 50 seconds.

(4) Inspect the finished shrink sleeve for condition. Ensure that the surface is smooth and free from splitting, and that the surrounding area of the cable is free from heat damage.

C. Instructions for Soldering Screen Braid.

WARNING: HEALTH HAZARD. MATERIALS USED IN THESE REPAIRS ARE COMPOSED OF POLYTETRAFLUOROETHYLENE (PTFE). THIS MATERIAL WILL EMIT TOXIC GASES WHEN SUBJECTED TO TEMPERATURES ABOVE 340 DEG C. THE HIGHER THE TEMPERATURE THE GREATER THE EMISSION OF TOXIC GAS. ADEQUATE VENTILATION IS TO BE PROVIDED WITHIN THE WORK AREA AND CLOSE TO THE HEATING SOURCE.

(1) Paint the cable braid area to be soldered with an approved flux (Kester 1544).

(2) Locate the solder sleeves over the braid ends, ensure that the solder rings are centrally located over the 0.25 in (6,25 mm) cable end areas.

(3) Allow a suitable Thermo-gun, such as the Raychem type CV1511-110 with a PR13C reflector, set at position 4, to warm-up for a five minute period at a power of 1100 watts.

(4) At the end of the five minute period the temperature must be between 500 and 600 deg C. Apply heat to the solder sleeves; ensure that the heat is evenly distributed around the sleeve periphery. A heat soak time of 25 to 35 seconds, will ensure a good solder flow.

(5) Check that the solder has run satisfactorily around the cable periphery, slight trace of solder should be visible around the edge of the solder sleeves and ensure that the cable adjacent to the joint shows no visible signs of heat damage.

END OF THIS SECTION

NEXT

INTAKE CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General

The air intake control system (AICS) provides duplex control of variable geometry surfaces in each engine air intake; these surfaces comprise movable front and rear ramps and a spill door. The position of the surfaces is automatically adjusted to ensure that a satisfactory flow of air to the engines is provided at all times and that the intake airflow at the engine face does not exceed 0.50 M. Therefore, at supersonic cruise each intake must decelerate the air flow from approximately twice the speed of sound at the intake entry to less than half the speed of sound at the engine face; during this process the air pressure is progressively increased as the airflow enters the intake. The majority of the compression is performed by shockwaves generated from the forward top surface of the intake, the principal compression occurring at the front ramp. (Ref. Fig.001 and 002).

The resulting shockwave pattern through the intake is as follows:-

(1) One oblique shock generated from the fixed wedge forming the leading edge of the intake roof (1st shockwave).

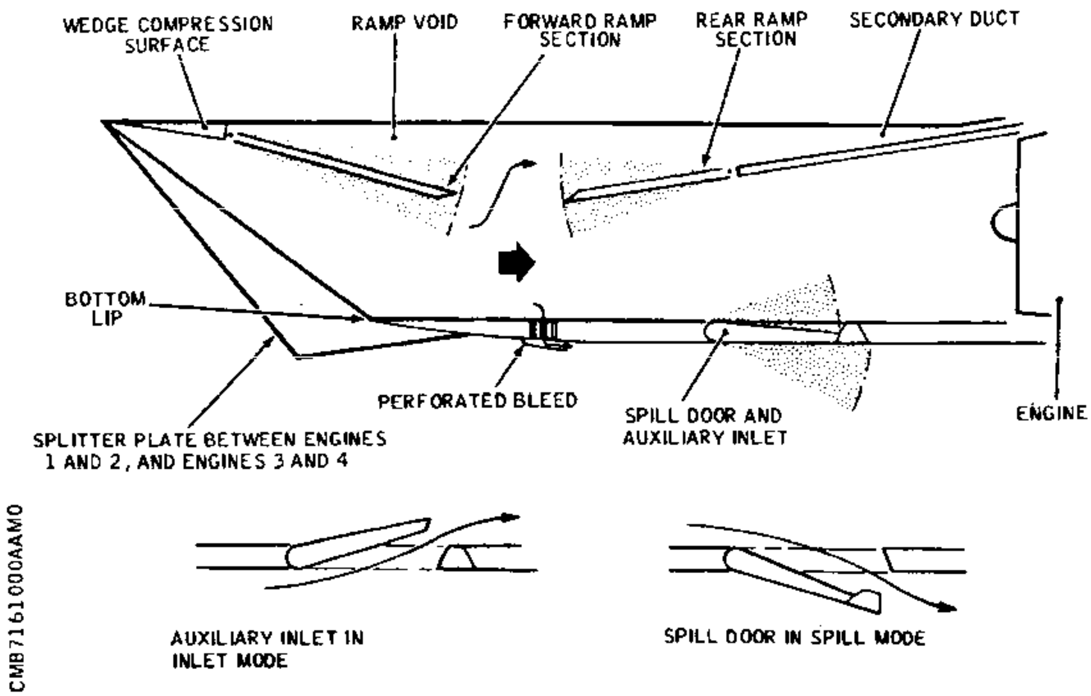
(2) One oblique shock generated from the movable ramp hinge (2nd shockwave).

(3) An isentropic compression fan shock generated from the shaped movable ramp (3rd shockwave).

(4) An oblique shock generated from the lip of the intake floor (4th shockwave).

The engine intake (Ref. 54-20-00) is basically rectangular in shape, with the ramps in the roof and the spill door in the floor. Electro-hydraulic actuators adjust the ramp angle and open or close the spill door in response to control signals from the AICS.

A perforated bleed is provided behind the bottom lip of the
R inner intakes to aid the intake performance at high supersonic
R mach numbers. The air flow through this bleed is limited only by the cross-sectional area of the perforations and is not otherwise controlled.



- Intake Control Surfaces - Diagrammatic
Figure 001

At take-off and low speeds an auxiliary inlet vane in the intake, integral with the spill door, provides extra air to the engine; the inlet vane is aerodynamically operated and is independent of the AICS. During operation of the spill
R door the inlet vane remains in the closed position.

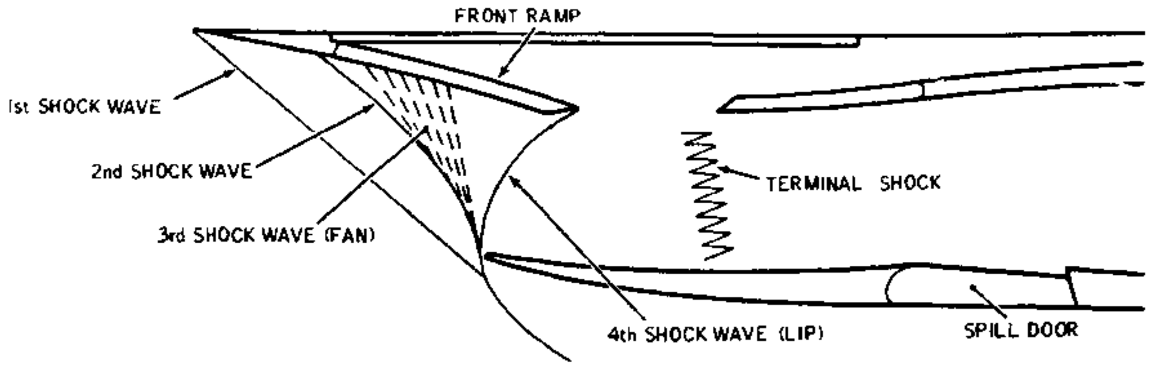
When reduction in intake airflow is required the ramps are positioned between scheduled minimum and maximum angular positions determined by control limits to -

(1) bring about a progressive reduction in velocity by creating a series of shockwaves (fan-shaped) before the intake,

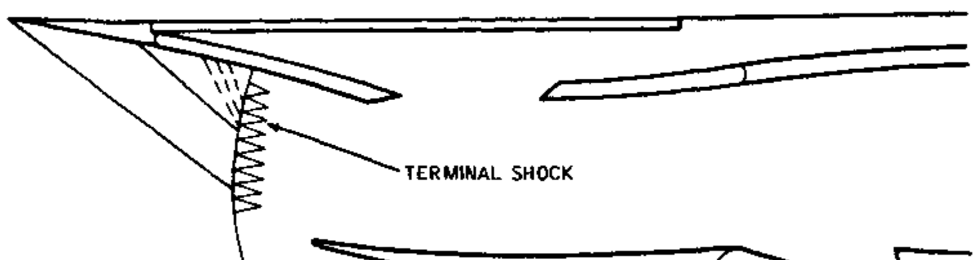
(2) maintain a resulting terminal shock at acceptable positions within the intake, and

(3) adjust the intake area as required to obtain maximum capture without spillage over the intake lip.

In the optimum configuration at any mach number the ramps are positioned to cause the shockwaves to converge on the



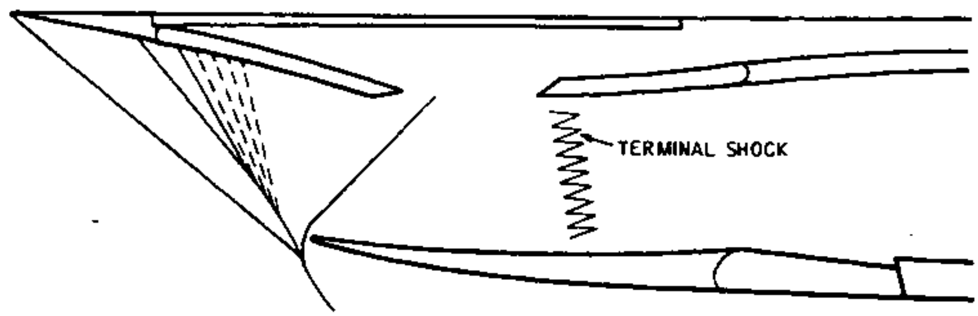
(A) SHOCK WAVES - OPTIMUM SUPERSONIC CRUISE POSITION



(B) DECREASE IN ENGINE DEMAND.

A DECREASE IN ENGINE DEMAND RESULTS IN THE TERMINAL SHOCK BEING PUSHED FORWARD. THE CORRECT CONFIGURATION IS RE-ESTABLISHED BY LOWERING THE RAMPS TO REDUCE THE TOTAL INLET AREA AND EXPELLING SOME OF THE INCIDENT AIRFLOW.

AT HIGH AMBIENT TEMPERATURES A SPILL DOOR IS AVAILABLE TO ACT AS AN EXTENSION OF THE RAMP OPERATION BY SPILLING EXCESS AIR THROUGH THE FLOOR OF THE INTAKES.



(C) INCREASE IN ENGINE DEMAND

AN INCREASE IN ENGINE DEMAND RESULTS IN THE TERMINAL SHOCK BEING DRAWN TOWARDS THE ENGINE, IF ALLOWED TO PROGRESS TOO FAR THIS WOULD RESULT IN ENGINE SURGING. THIS SITUATION CAN BE IMPROVED ONLY BY REDUCING THE ENGINE DEMAND.

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- Shockwave Configuration - Diagrammatic
Figure 002

lower lip of the intake floor (Ref. Fig. 002). At high ambient temperatures, when the ramp maximum angular limit is reached and reduction in airflow is still required, the ramp control schedule is maintained by spilling excess air from the intake through the spill door. Opening the spill door increases the ramp angle maximum limit whilst still maintaining satisfactory airflow to the engine. During certain operating conditions it is also necessary to open the spill door before the ramp angle maximum limit is reached. In addition, the spill door can be opened independently of the ramp, so that if the engine speed suddenly falls, excess air can be dumped by momentarily opening the spill door.

The primary control parameter in the AICS is ramp void (bleed) pressure recovery which is the ratio of ramp void total pressure with respect to freestream total pressure. In practice, direct measurement of total pressure is difficult, so the static pressure in the ramp void, i.e., the area above and between the forward and rear ramp is used; thus the primary control parameter becomes static pressure divided by freestream total pressure, which is designated Eta-V. (Ref. Fig. 003). The control system produces a control schedule, (Eta-V Sched.) which is a function of flight conditions, and then maintains Eta-V between maximum and minimum positions, by adjustment of the ramp and spill door positions, so as to provide optimum engine/intake compatibility at and above normal operating temperatures. Low temperature operation necessitates a reduction in the engine low pressure compressor speed (N1) in order to reduce the engine mass flow requirements, to achieve this a maximum allowable value of N1/square root of theta as a function of the intake local mach number (Mo) is used (Auto N1 Reduce).

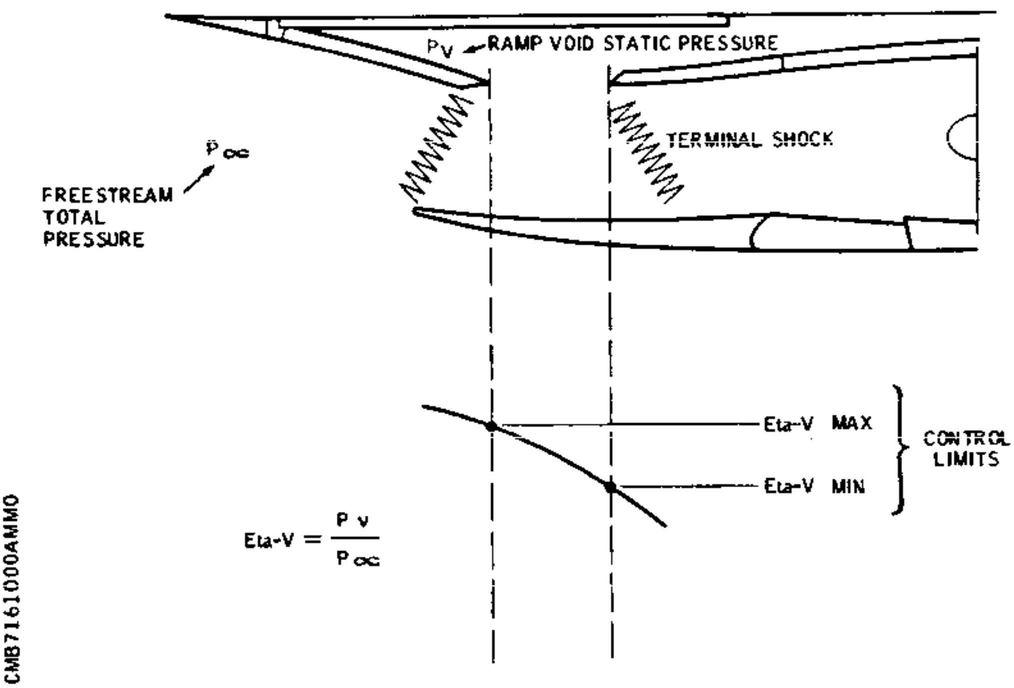
Below 0.7 M (freestream) the ramps are held fully up and the spill doors are closed. Between 0.7 M and 1.3 M the ramps and spill doors are scheduled as a simple function of N1. This is to avoid minor instability in the intake when the engines are below 'flight idle' at transonic speeds. Above 1.3 M the ramps and spill doors are controlled by the Eta-V Sched.

The Eta-V Sched is derived from the following parameters:

(1) Measured freestream total pressure (Pt)

(2) Measured freestream static pressure (Ps)

(3) Measured incidence (Alpha)



- Control Principles - Eta-V Control Limits
Figure 003

R (4) Ramp angle (Delta-2)

The measured freestream total pressure, freestream static pressure and incidence signals are processed in four air intake sensor units (AISUs). The output from the AISUs together with ramp void static pressure, ramp angle, spill door angle and engine low pressure compressor speed signals from the intakes and engines are processed in eight air intake control units (AICUs) to provide two separate and independent control lanes designated A and B for each intake (Ref. Fig.004 and 005).

Each AICU consists basically of two main areas:-

(1) Arithmetic Processor

The arithmetic processor computes true values of incidence and freestream total and static pressures. From these parameters freestream mach number and local mach number are obtained.

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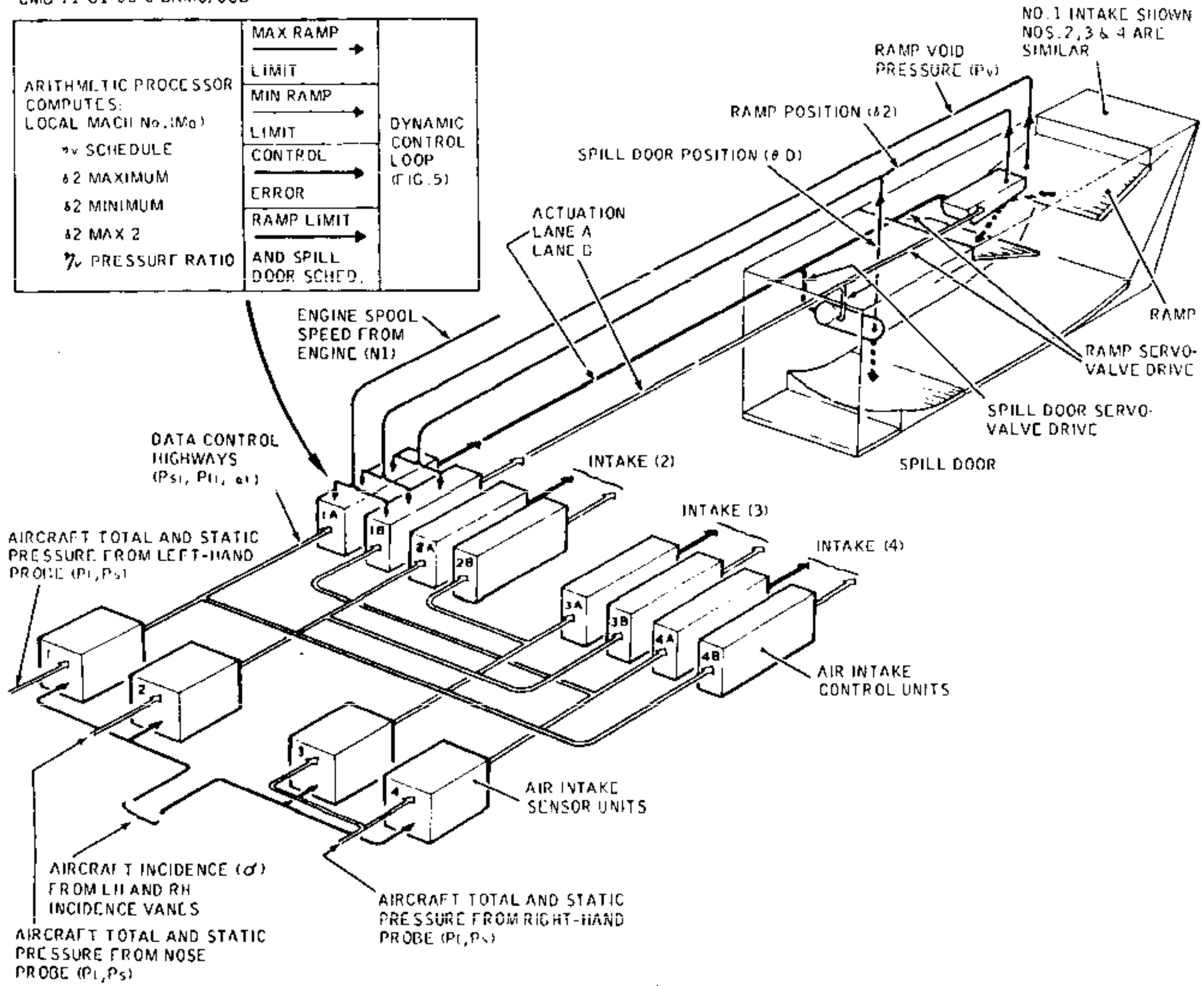
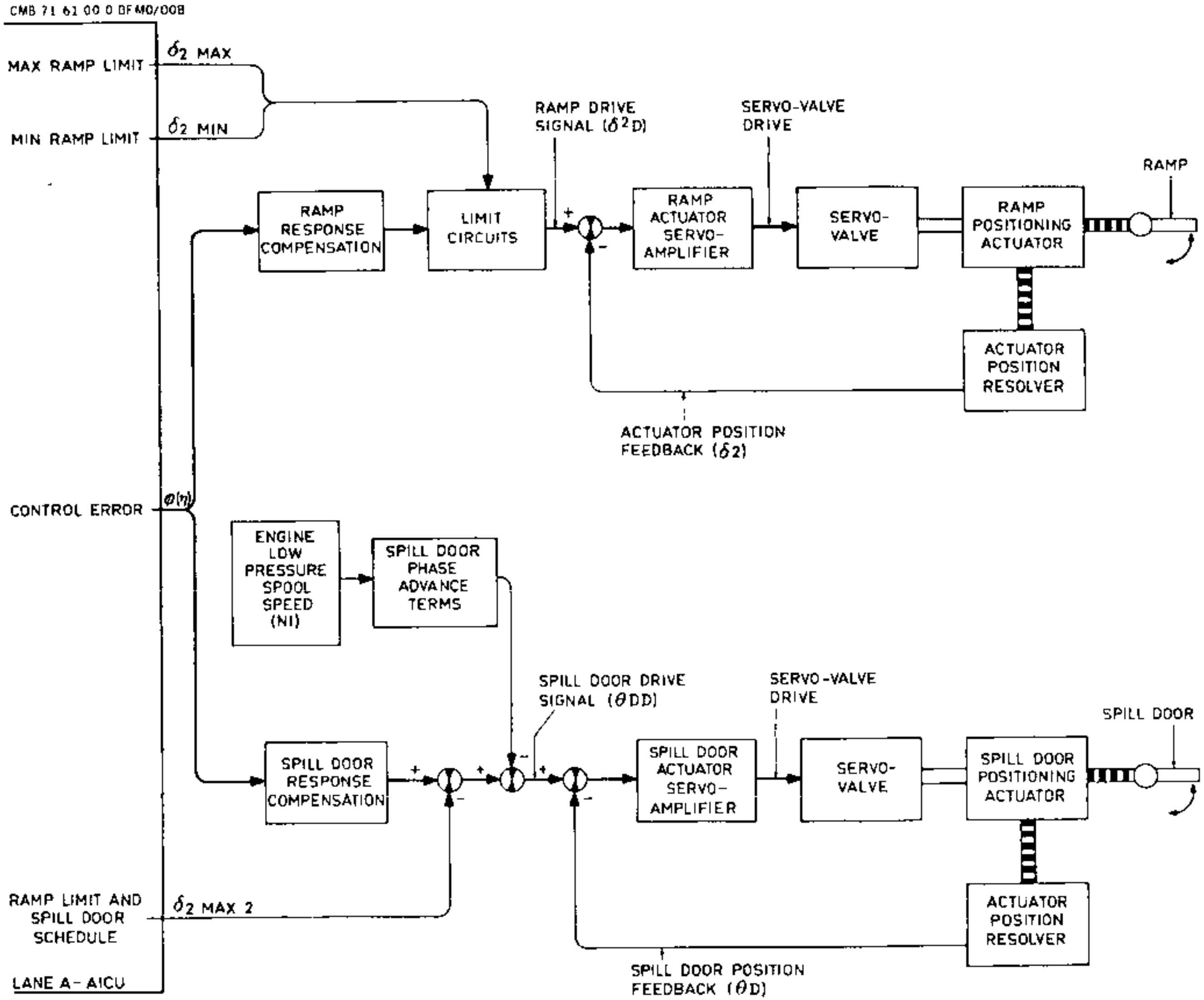


- Intake Control System - Block Diagram
Figure 004

EFFECTIVITY: ALL

BA



- Dynamic Control Loop - Block Diagram
Figure 005

R From local mach number, incidence and ramp angle
R the Eta-V Sched., ramp angle limits and spill door
R schedule are computed. Finally the control parameter
R (Eta-V) is obtained and, if a difference exists
R between Eta-V and Eta-V Sched., a control error
R signal (Phi-Eta) is produced.

(2) Dynamic Control Loops (Ref. Fig. 005)

The dynamic control loops consist of ramp and spill door position control loops together with the ramp angle and spill door angle demand loops. The control loops receive the following inputs:-

(a) Ramp angle and spill door angle maximum and minimum limits.

(b) Engine low pressure compressor speed.

(c) Control error signals.

These signals together with actual ramp and spill door angles are processed to provide analogue ramp drive and spill door drive signals which position the ramp and the spill door to remove the error between Eta-V and Eta-V Sched.

Each AICU also provides control signals for the associated engine control systems (Ref. Chap.77) as follows:-

(1) Auto N1 Reduce

When cruising supersonically under cold climatic conditions the optimum air intake to engine matching is achieved by automatically reducing the engine mass flow, thus preventing operation with the terminal shock too far into the intake.

The auto N1 reduce signal is provided by scheduling N1/square root of theta against local mach number. The resulting signal is applied to the engine control system as a limiting term. Failure of this signal results in an auto N1 reduce failure signal being applied to an AUTO N1 REDUCE failure warning lamp on an associated N1 indicator on the engine control panel (Ref. Chap.77).

(2) Engine Handling

The engine handling signal is a total pressure continuous signal which is applied to the associated

ECS N2 amplifier so as to modify N2 to enable a constant turbine entry temperature to be maintained. This signal is also used during engine starting and acceleration.

The AICUs also perform cross-monitoring functions on the freestream mach number and incidence control signals. Each control signal is compared with two separate monitoring signals received from two different AICUs; in all cases the control signal must differ from both the monitoring signals for a failure signal to be given.

Either the A or the B control lane for a particular intake is selected at an auto control panel (ACP) to effect control of the ramp and spill door actuators, in conjunction with either a main or a standby hydraulic supply.

An automatic control facility enables the intake configuration to be controlled automatically and, if a failure occurs, displays appropriate warnings and automatically transfers a failed control lane to the other lane and/or a failed main hydraulic system to the standby system. Failure of both hydraulic systems results in the ramp and spill door being retained in the failed 'frozen' position; the ramp is locked by a brake, integral with the ramp actuator, and the spill door is locked by non-return valves integral with the spill door actuator. Failure of both control lanes also results in the locking of both ramp and spill door actuators.

During take-off and at speeds below 0.60 M the ramps and spill doors remain fully-up. Faults resulting in the lowering of the ramps or spill doors during these conditions are detected by a take-off monitor in the associated AICU and remedial action is initiated to restore the ramps or spill doors to the fully-up position.

A manual ramp and door raise/lower facility is provided on a manual control panel (MCP) to enable the ramp and spill door to be inched to the required configuration if both A and B control lanes fail. This facility is also available on the ground to assist in maintenance operations. Eight position indicators display the position of each ramp and spill door as a percentage of travel.

R Monitor signals from the ramp and spill door position
R circuits together with ramp void pressure monitoring
R signals are applied to the flight data recording system
R (Ref. 31-31-00).

R A pre-flight check facility and failure monitoring of

equipment in the AICS is provided by an air intake test panel (AITP) operating in conjunction with an air intake test unit (AITU). Failed items of equipment are identified by illuminated captions on the AITP; this facility is available in flight and during pre-flight checks.

Digital data within the AICS are transmitted on two separate highways designated control and test. The control highway links the four AISUs with the eight AICUs and the test highway links the AITU with each AISU and each AICU.

2. Air Intake Sensor Unit (Ref. Fig. 006)

Four air intake sensor units (AISUs) are mounted in the flight compartment equipment racking, two on shelf 10-215 and two on shelf 10-216. Each AISU is contained in a 3/8 ATR short case. Two torque motor pressure sensors are mounted in the front of the case with manometric couplings projecting through a front panel.

The upper coupling is designated STATIC and the lower coupling is designated PITOT. Quick release static and pitot connections are made to these couplings from the associated air data computer system (Ref. Chap.34). The electrical components are housed in the rear of the case and electrical supplies and signal connections are made at a connector on the rear of the case.

Each AISU either measures the aircraft air data, namely incidence, total and static pressures, which are in analogue form, and processes them to produce a serial digital data output, or, receives digital data from the AITU as pre-flight check instructions, which are similarly processed.

The total and static pressure inputs are applied to the torque motor pressure sensors which operate in conjunction with a printed circuit board to produce analogue signals proportional to the applied pressure.

The signals are then multiplexed together in an analogue multiplexer, the output of which is converted to a 12-bit format by an analogue-to-digital converter (A-D) to provide digitized output signals.

The digital pre-flight check instructions are received by a test highway receiver. This receiver is electrically isolated from the test highway by an optical coupler.

The AISU output is transmitted on the control highway, to two AICUs each associated with a different engine, by a

control highway transmitter which transmits either the A-D output, or, when a 28 V d.c. signal is applied by the AITU, the output of the test highway receiver.

3. Air Intake Control Unit (Ref. Fig.007 and 008)

Eight air intake control units (AICUs) are mounted in the rear equipment racking, four in zone 243 and four in zone 244. Each AICU is contained in a 1/2 ATR long case. Electrical supply and signal connections are made at a connector on the rear of the case. A connector, designated TEST, is mounted on the front panel of the case together with an elapsed time indicator. The test connector provides a monitoring facility during ground maintenance.

Each AICU supplies either an A or a B control lane for a particular intake and functions as previously described in 1. General.

When a failure condition is sustained, monitor comparators provide failure outputs to operate relays within the AICU. The relays effect control in the lane selection logic as follows:-

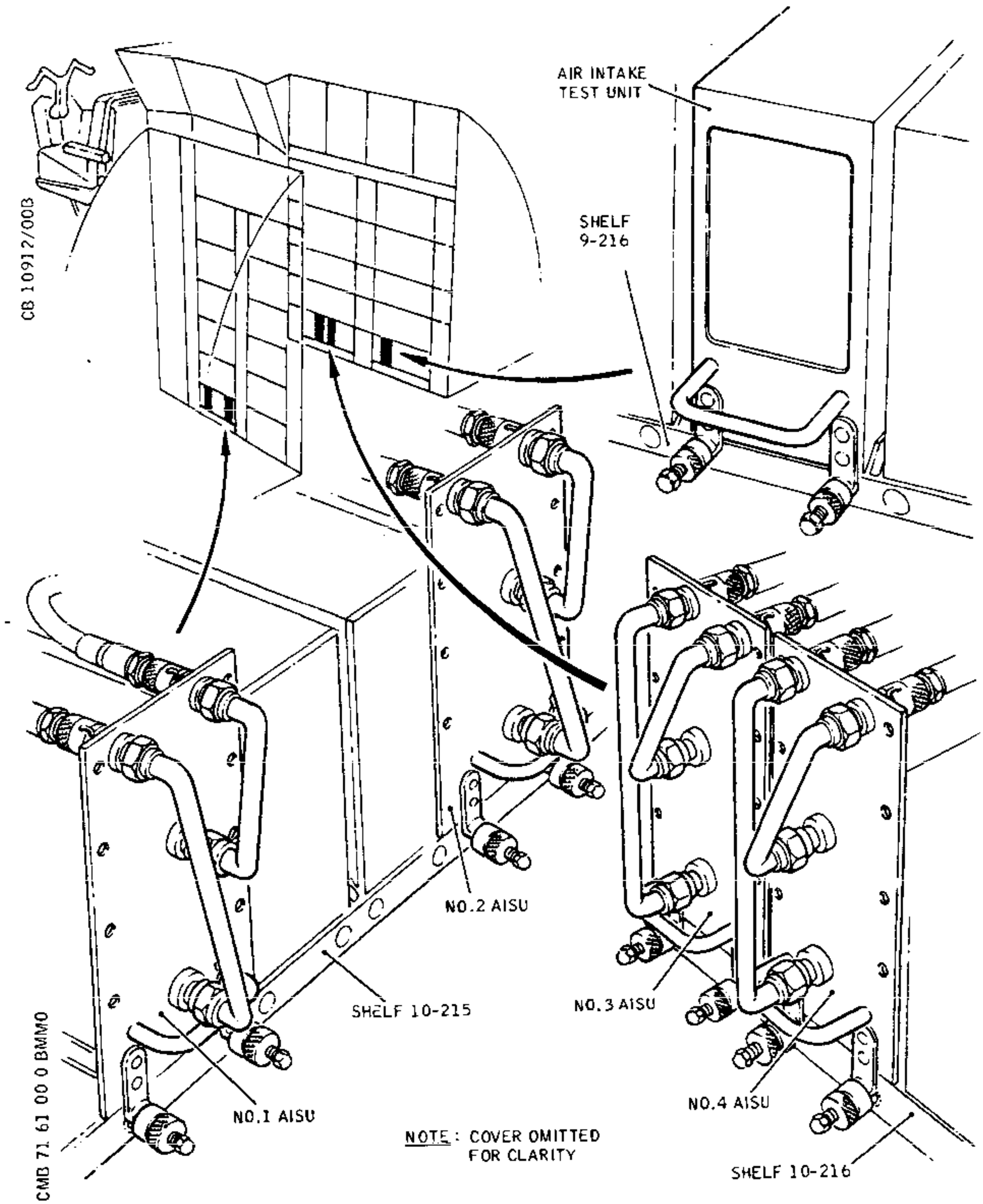
(1) 'Lane good' (L) relay - energized when the AICU is serviceable, ensures that an unserviceable AICU cannot maintain a lane-in-use.

(2) 'N1 good' (N) relay - energized when the N1 signal input to the AICU is 'good'. Ensures that an automatic mode cannot be selected or maintained if the N1 signal is not present.

(3) Ramp fail (R) relay - energized when the ramp control circuits are serviceable. De-energized when a failure
R is detected, to initiate transfer to the standby hydraulic
R supply; if the change-over re-energizes relay R
the lane is retained 'in-use', however, if the failure condition remains the lanes are changed over (Ref. para.B.).

(4) Door fail (D) relay - energized when the door control circuits are serviceable. De-energized when a failure is detected, to effect control in a similar manner to that described for the ramp fail relay.

(5) Subsonic monitor (SM) relay - normally de-energized, energized if the ramps and/or spill doors commence to descend at speeds below 0.60 M. When energized initiates de-selection of the lane-in-use.



- Location of Equipment - Flight Compartment Racking
Figure 006

R

(6) Hold (H) relay - energized for 250 ms when a lane failure condition is present to prevent transient failures from giving lane failure indications and to prevent false signals from being applied to the ramp and spill door actuators. A maximum limit of 0.5 s on the time that the hold facility can be imposed, is effected by associated lane not in use and control unit deselect relays in conjunction with an external control unit
R deselect delay relay (Ref. para.20.).

(7) Control unit deselect (CUD) relay - normally de-energized, energized by an associated control unit deselect delay relay 0.5 s after a processor failure, to initiate de-selection of the lane-in-use.

(8) Lane not in use (NL) relay - normally de-energized, energized after a processor failure, to initiate operation of the associated control unit deselect delay relay.

A lock test relay (T) is utilized in each lane B AICU to enable the spill door hydraulic locks to be tested during the automatic test procedure initiated by the AITP.

4. Air Intake Test Unit (Ref. Fig. 006)

The air intake test unit (AITU) is contained in a 1/2 ATR short case and mounted in the flight compartment rear racking, shelf 9-216. Electrical supply and signal connections are made at a connector on the rear of the case.

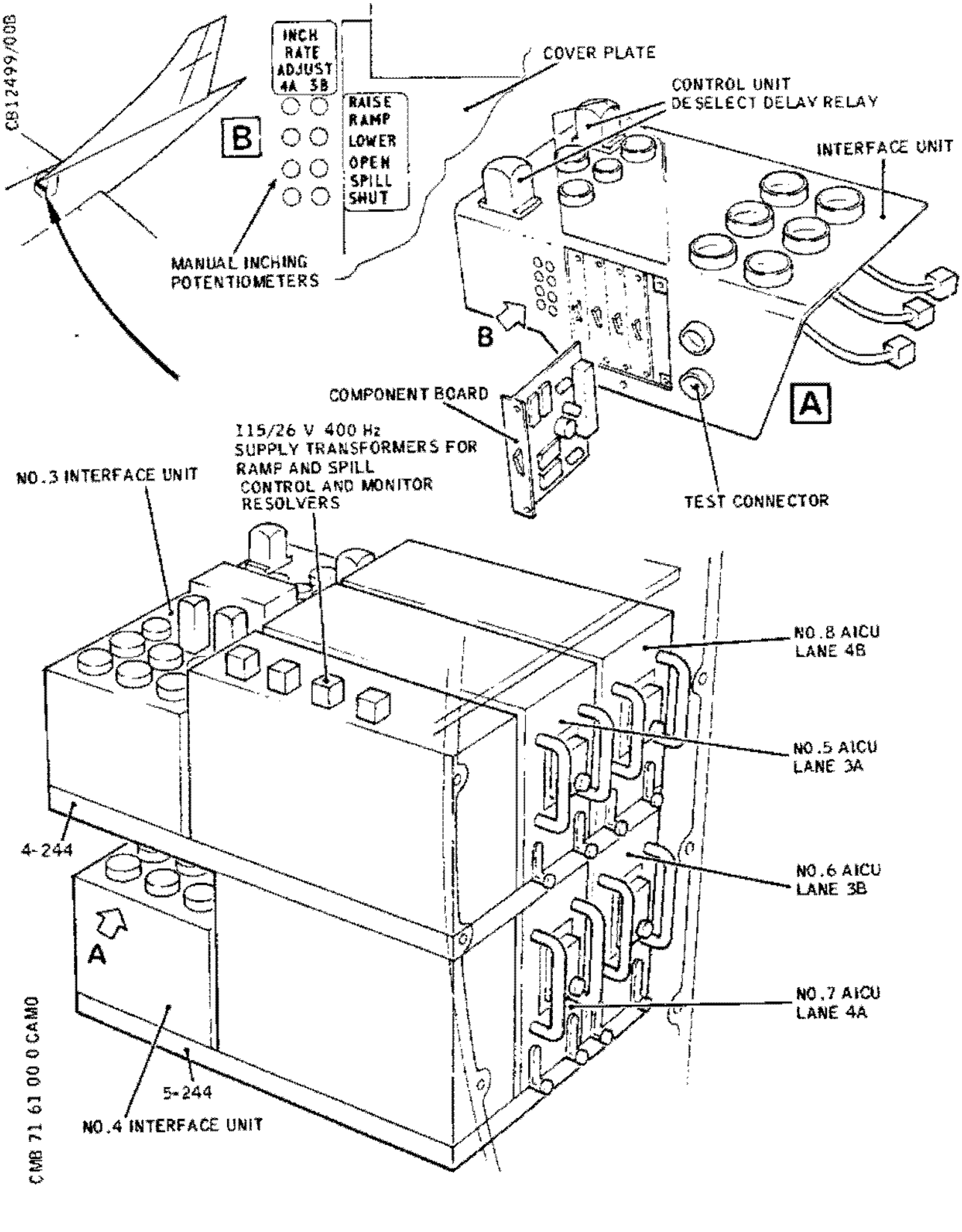
Functionally, the AITU provides two separate facilities as follows:-

(1) Equipment Failure Identification In-flight

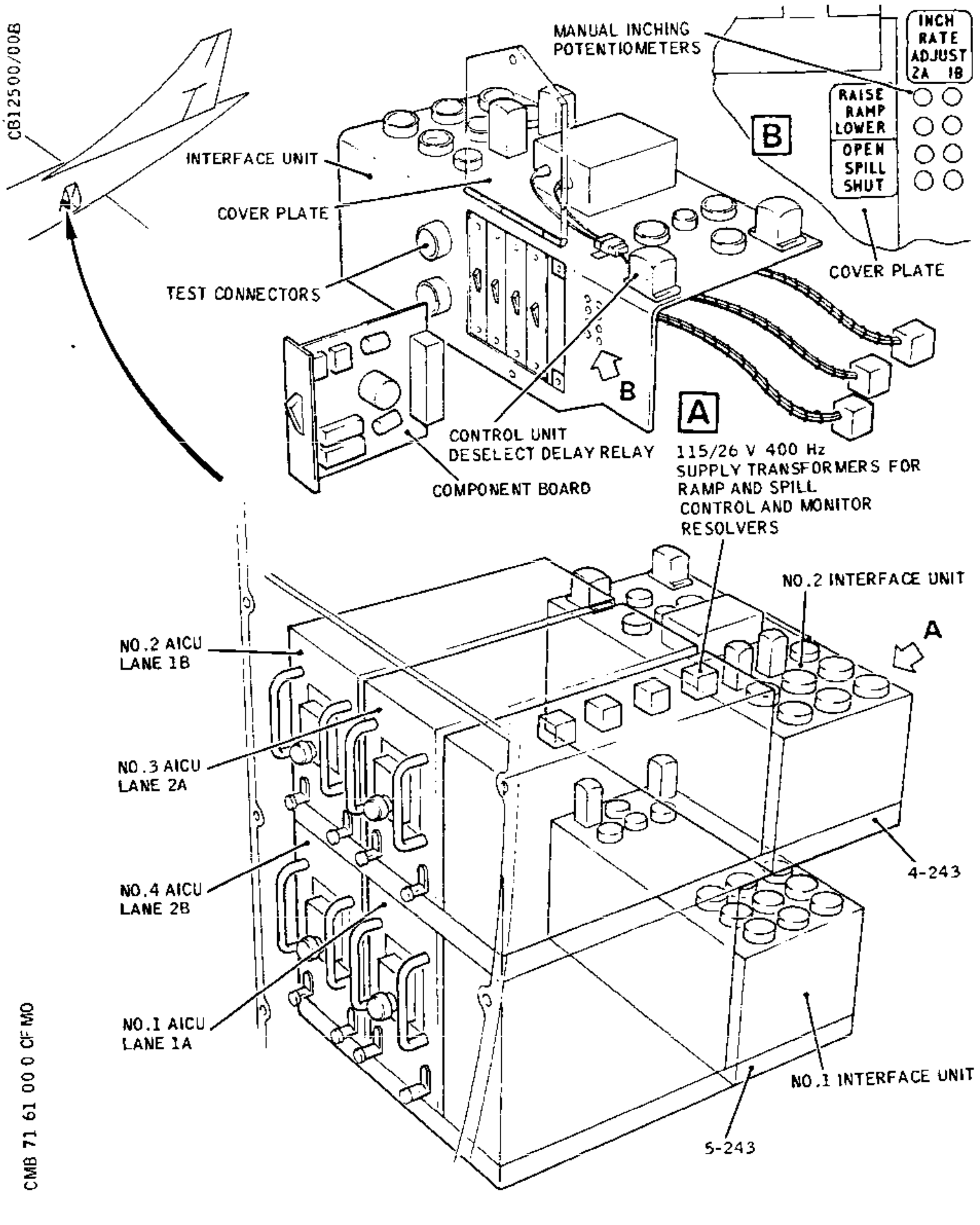
The test highway connects the AITU to each AICU, enabling the AITU to interrogate each AICU and to read off its status. This information is processed by the AITU to determine if any item of equipment has failed. If a failure is detected, a signal is applied to the appropriate failure monitor caption on an associated air intake test panel (AITP); this caption remains illuminated for the remainder of the flight, but if required, it can be extinguished by a switch on the AITP.

(2) Pre-flight Check

The test highway also allows the AITU to transmit simulated aerodynamic instructions, including



- Location of Equipment - RH Rear Equipment Racking
R Figure 007



R - Location of Equipment - LH Rear Equipment Racking
Figure 008

simulated failures, which produce an automatic check on the ground of the operating integrity of the AICS. Any dormant failures in monitoring are detected, together with lane and hydraulics change-over and actuator failures.

5. Absolute Pressure Sensor (Ref. Fig. 009)

Sixteen absolute pressure sensors, four located in the roof of each intake, sense the ramp void static pressure. Each sensor operates in conjunction with a second sensor to form a pair (control and monitor) in an A or B control lane.

Each sensor basically consists of a chassis assembly mounted on a base assembly and enclosed by a case. The chassis assembly consists of an evacuated bellows, a sensor beam, an E-core differential transformer, a torque motor, a shaft and pivot assembly, part of a temperature compensation network, an upper and lower cover, and the chassis.

When the bellows in the sensor sense a change in pressure, the bellows apply a corresponding force to unbalance the beam. Beam imbalance is detected by the E-core differential transformer which generates an error signal which is applied to the oscillator servo amplifier (OSA) housed in the associated AICU. The OSA generates a 0-10 V d.c. output signal for the AICU, and a corrective d.c. supply for the sensor torque motor, which exerts a restoring force on the beam, and the beam is returned to a null/balance position. The OSA also contains the other portion of the sensor temperature compensation network.

Each OSA controls both the control and the monitor sensors in the lane, using two identical and independent circuits.

6. Auto Control Panel (Ref. Fig. 010)

An auto control panel (ACP), mounted on the management panel at the third crew member's station, contains all the controls required for selecting the required hydraulic system and the A or B control lane for operation in the automatic control mode, together with the associated failure captions.

In addition, selector switches on this panel enable control of the AICS to be transferred to an air intake manual control panel if the automatic control modes fail or if it is required to manually inch the ramp and/or spill doors. These switches are fitted with safety guards at the AUTO position to prevent inadvertent manual selections.

The electrical circuitry associated with each intake is

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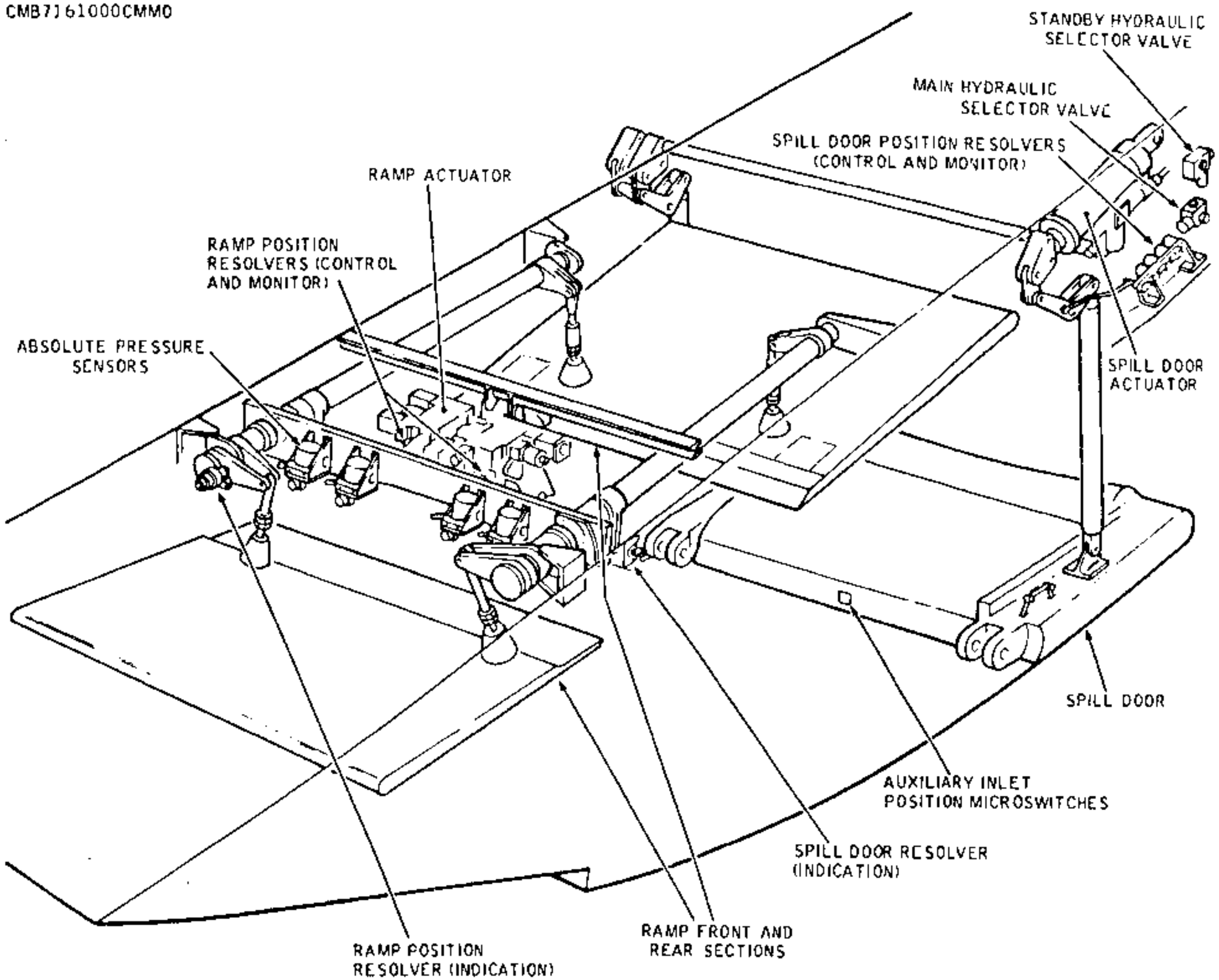

- Location of Equipment - No.1 Intake
Figure 009

EFFECTIVITY: ALL

R BA

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contained on two printed circuit boards (PCBs) designated A and B, so as to physically and electrically isolate each intake from the other three intakes. The cards (eight) are inserted from the rear of the panel, via card guides, into eight 64-way connectors and protected by a hinged glass-fibre dust cover.

Relays mounted on the PCBs initiate system control and indication as follows:-

(1) Board A

(a) Relay RLA1 - not used.

(b) Relay RLB1 (Ref. Fig. 027)

Relay RLB1, which is normally in the de-energized state, provides a dimming facility for the LANE failure captions. Energization of the relay is effected by a dimming command signal from the flight compartment lights test and dimming circuit (Ref. 33-14-00).

(c) Relay RLC1 (Ref. Fig. 027)

Relay RLC1, which is normally in the de-energized state, effects control of the lane A LANE failure caption. Energization of the relay is effected by the failure of the 'lane good' signal from the associated AICU.

(d) Relay RLD1 (Ref. Fig. 027)

Relay RLD1, which is normally in the de-energized state, effects control of the lane B LANE failure caption. Energization of the relay is effected by the failure of the 'lane good' signal from the associated AICU.

(e) Relay RLE1 (Ref. Fig. 027)

Relay RLE1, which is normally in the de-energized state, effects control of the N1 SIG failure caption. Energization of the relay is effected by a failure of the 'N1 good' signal from the associated AICU. When energized, the relay is electrically latched in the energized state; a reset facility is provided by the lane selector switch and relay RLH2.

(2) Board B

(a) Relay RLA2 (Ref. Fig. 018)

Relay RLA2, which is normally in the energized state, effects control of the automatic change-over to the standby hydraulic system if a main hydraulic failure occurs, and initiates illumination of the HYD failure caption. De-energization of the relay is effected by removal of a hold-on signal by the failed system control circuit. Subsequent manual selection of the standby hydraulic system causes the relay to be re-energized to effect control of the HYD failure caption only.

(b) Relay RLB2 (Ref. Fig. 026)

Relay RLB2, which is normally in the de-energized state, provides a filament test facility for the 'lane in use' lamps. Energization of the relay is effected by a lights test signal from the flight compartment lights test and dimming circuit (Ref. 33-14-00).

(c) Relay RLC2 (Ref. Fig. 018)

Relay RLC2, which is normally in the de-energized state, provides a main hydraulic reset facility during the pre-flight check procedure. Energization of the relay is effected by a 'lane/hyd reset' signal from the air intake test unit.

(d) Relay RLD2 (Ref. Fig. 026)

Relay RLD2, which is normally in the de-energized state, effects control of the INT failure caption. Energization of this relay is effected by the failure of both 'lane in use' signals. A delay on energizing of 600(±150) ms is provided to enable lane transfers to be effected without giving a transient intake failure indication.

(e) Relay RLE2 (Ref. Fig. 026)

Relay RLE2, which is normally in the energized state, effects control of the automatic change-over from lane B to lane A and the intake failure relay RLD2. De-energization of relay RLE2 is effected by the failure of the selected 'lane in use' signal.

(f) Relay RLF2 (Ref. Fig. 026)

R Relay RLF2, which is normally in the energized
R state, effects control of the automatic change-
R over from lane A to lane B. De-energization of
R the relay is effected by the failure of the
R selected lane 'lane in use' signal.

R (g) Relay RLG2 (Ref. Fig. 027)

R Relay RLG2, which is normally in the de-energized
R state, effects control of the 'alpha fail' caption.
R Energization of the relay is effected by the
R failure of the 'alpha good' signal from the
R associated AICU.

R (h) Relay RLH2 (Ref. Fig.023 and 027)

R Relay RLH2, which is normally in the de-energized
R state, provides a lane A and N1 signal reset
R facility during the pre-flight check procedure.
R Energization of the relay is effected by a
R 'lane/hyd reset' signal from the air intake test
R unit.

R (i) Relay RLJ2 (Ref. Fig. 026)

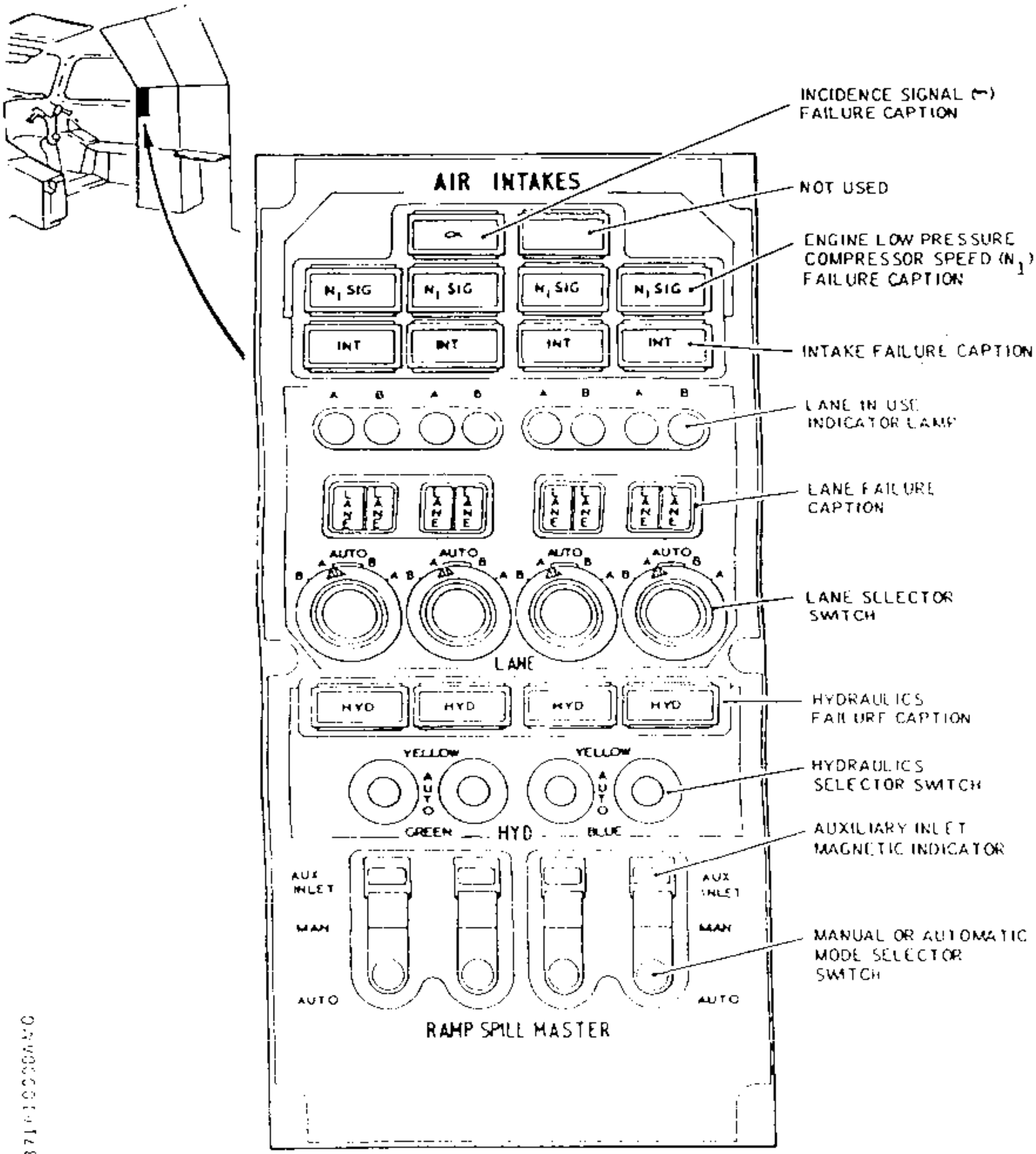
R Relay RLJ2, which is normally in the de-energized
R state, provides a dimming facility for the 'lane
R in use' lamps. Energization of the relay is
R effected by a dimming command signal from the
R flight compartment lights test and dimming circuit
R (Ref. 33-14-00).

All the failure captions are provided with a filament
'press-to-test' facility which also initiates operation of
the associated master warnings. An overall filament test
R and a dimming facility for the LANE captions and the 'lane
R in use' lamps are also provided (Ref. 33-14-00).

Magnetic indicators indicate the positions of the auxiliary inlet vane in the spill doors, by displaying OPEN (inlet fully open), diagonal stripes (inlet partially open) or SHUT (inlet fully closed).

7. Manual Control Panel (Ref. Fig. 011)

A manual control panel, mounted directly below the ACP at the third crew member's station, contains ramp and spill door position indicators and ramp and spill door manual inching switches. Control by these switches is inhibited until a manual selection is made at the ACP.



Auto Control Panel (ACP)
Figure 010

R Provision is made on the front of the panel for the
R fitting of an anti-interference plate to enable the
R inching switches to be locked off on the ground to
R prevent unauthorized operation of the ramps and spill
R doors. This plate also prevents operation of the RAMP - SPILL
R MASTER switches on the ACP.

Each ramp and spill door position is presented in percentage of travel on an indicator scale of 240 deg. The pointer rotates clockwise with 0 per cent at 20 deg (12 o/clock) and 100 per cent at 240 deg. The scale below 20 deg is unmarked and represents power off.

In addition, eight demodulators and four demodulator power supply units, mounted within the panel, provide power supplies for the ramp and spill door indicators and the associated ramp and spill door position resolvers (Ref. Fig. 015). Each power supply unit has a separate supply source.

8. Air Intake Test Panel (Ref. Fig. 012)

An air intake test panel (AITP), mounted on panel 8-214 at the third crew member's station, contains all those controls and indicators required to effect a pre-flight check on the ground and those indicators required to identify failed equipment in flight.

Captions, in the form of abbreviations or symbols, identify equipment as follows:

CU = Control unit

SU = Sensor unit

PV = Ramp void absolute pressure sensor

RA = Ramp actuator

SA = Spill door actuator

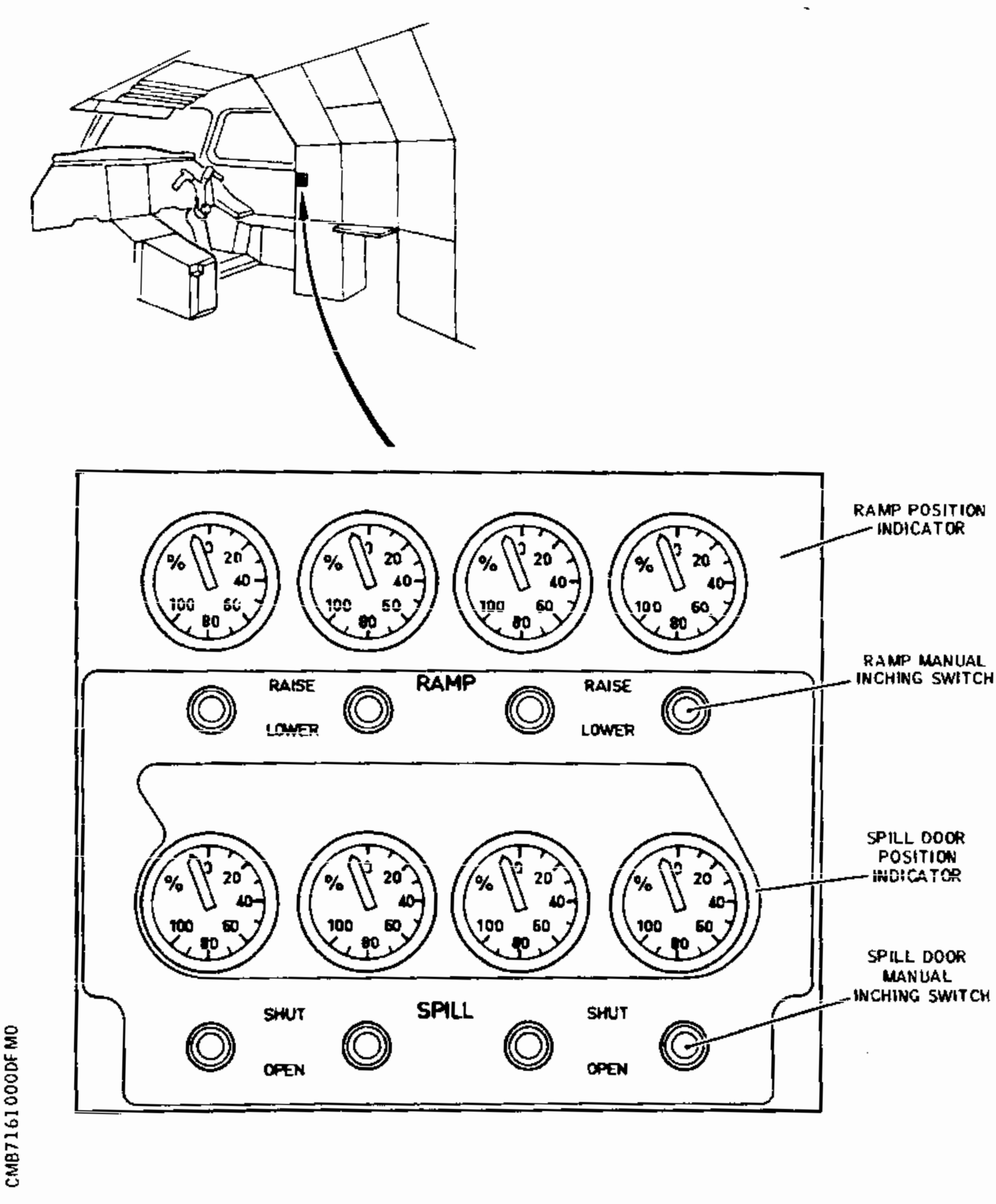
RP = Ramp position resolvers

SP = Spill door position resolvers

N1 = Engine low pressure compressor probe

Alpha Symbol = Incidence sensor

The remaining six captions, numbered 1, 2, 4, 8, 16 and 32, are related to the pre-flight check sequence pattern.



Manual Control Panel (MCP)
Figure 011

A guard is fitted to the pre-flight check selector switch to prevent inadvertent selection.

An overall filament test and dimming facility is provided for the failure captions (Ref. 33-14-00).

R 9. AICS Ground - Flight Switches (Ref. Fig.031 and 032)

Four two-position, double-pole, double-throw, toggle switches designated AICS GROUND - FLIGHT, are mounted on the RAM AIR TURBINE test panel at the 3CM station.

Normally, each switch is guarded and locked in the FLIGHT position. In this position the pre-flight check (PFC) select line from the intake test panel (AITP) is interrupted, thus ensuring that a fault in the AITP cannot cause the PFC to be selected in the air.

In the GROUND position the PFC select line is completed and the master warning red INT warnings are initiated.

10. Pressure Ratio Error Indicators (Ref. Fig. 013)

Four pressure ratio error indicators and associated trimming potentiometers, one indicator for each intake, are mounted on panel 35-214 at the 3CM station.

Each indicator is basically a moving coil instrument driven by signals from the appropriate AICU via a selector relay in the interface unit (Ref. Fig. 014).

Provision of these indicators allows the pressure ratio error on an engine with a 'frozen' intake to be monitored and subsequently adjusted by altering the affected engine throttle settings to minimize the risk of engine surge.

11. Ramp Actuator (Ref. Fig. 009)

Four ramp actuators (Ref. 71-63-00), one mounted in the roof of each intake, between the forward and rear ramp sections, position the ramps in response to control signals from the AICUs or from the ramp manual inching switches. Each actuator has a main and a standby hydraulics selector valve and two hydraulic motors with integral servo-valves and position pick-offs. Each servo-valve/hydraulic motor is powered by a particular hydraulic system, main or standby, and is controlled by either an A or B control lane. Either servo-valve/hydraulic motor can operate the ramp, both motors being mechanically coupled to a common gearbox. A hydraulic brake unit, which is held off when hydraulic power is applied to either hydraulic motor, ensures that the ramp is held in the fully-up position prior to

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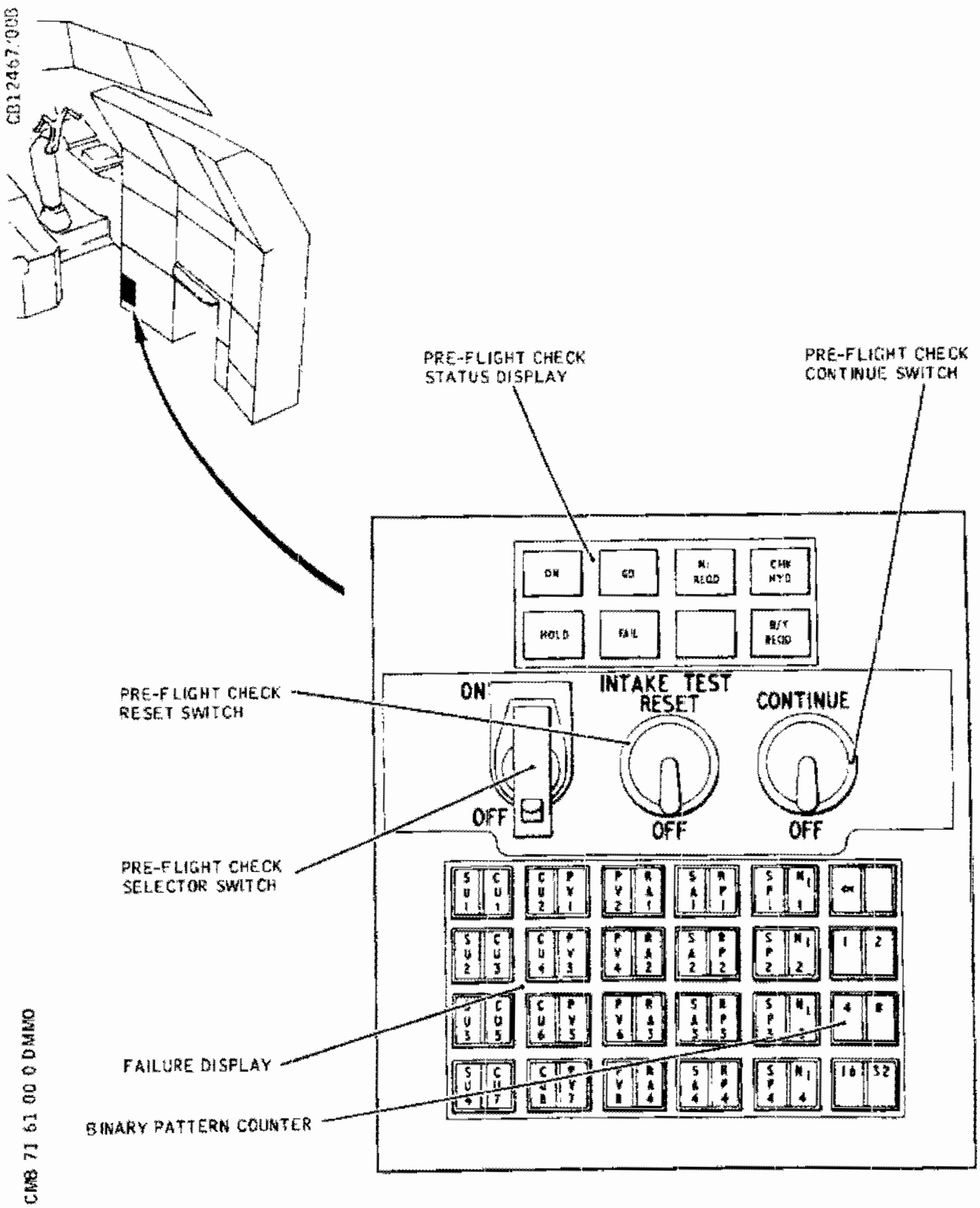
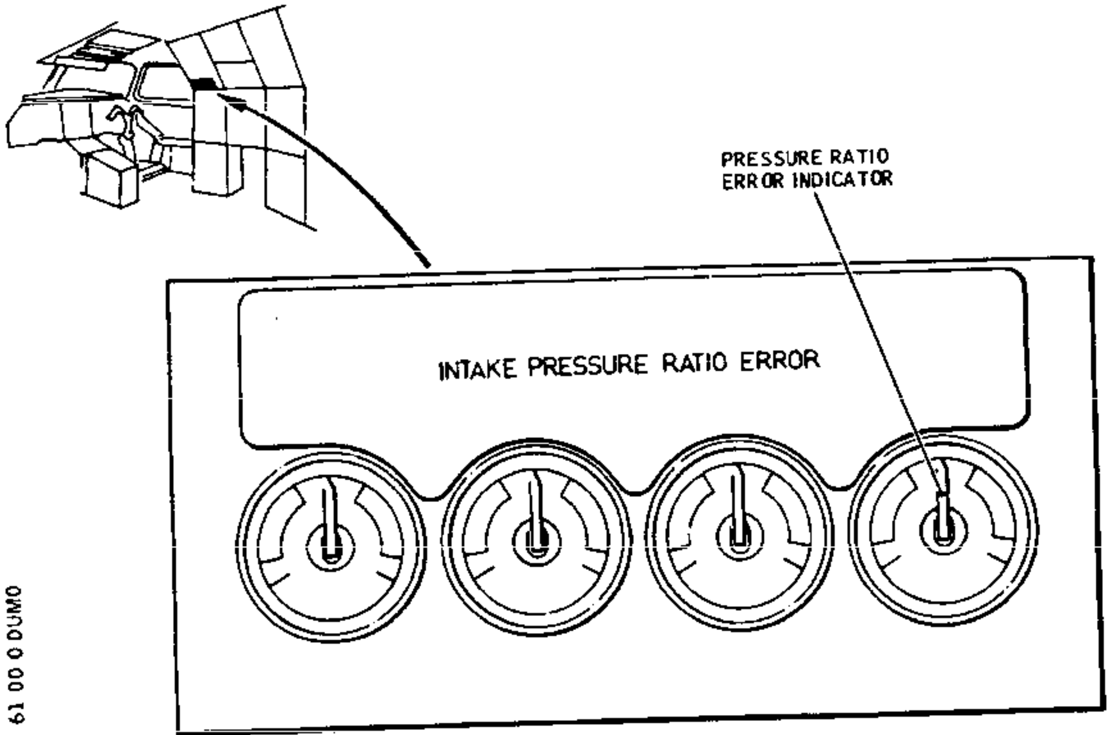


R - Air Intake Test Panel (AITP)
Figure D12



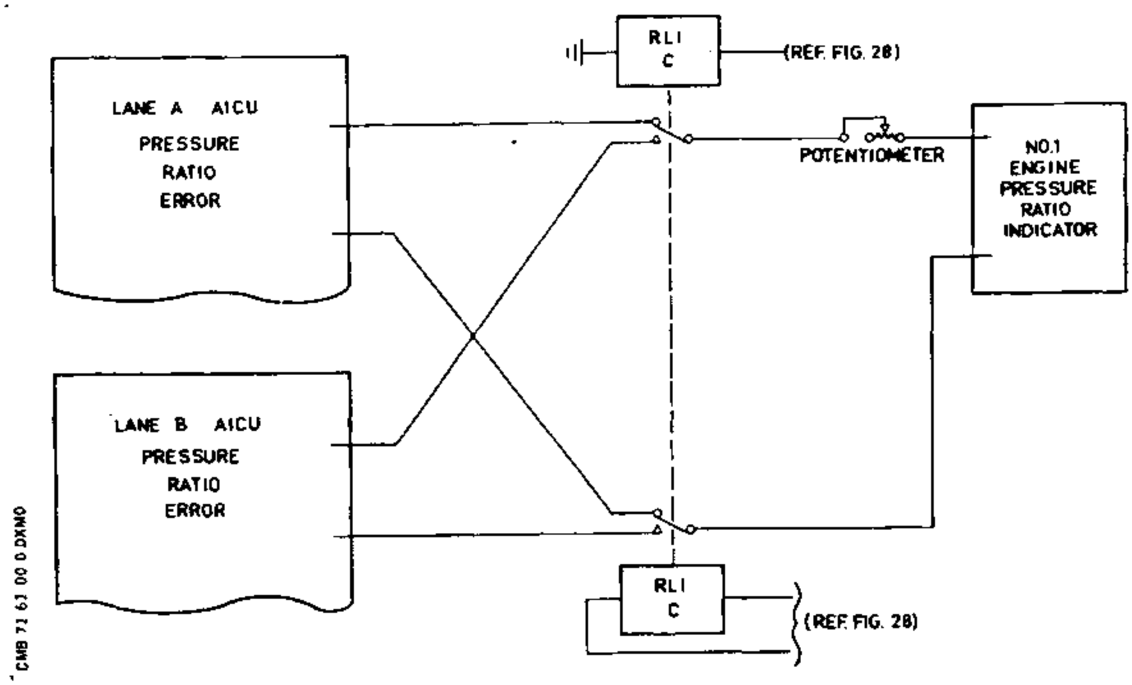
Location of Equipment -
Pressure Ratio Error Indicators
Figure 013

selection and, in addition, the brake holds the ramp in position against aerodynamic loads if the hydraulics or electrical supplies fail completely. This brake is also used to lock the ramp if certain system failures occur. A lock test solenoid enables the brake to be tested on the ground.

12. Spill Door Actuator (Ref. Fig. 009)

Four spill door actuators (Ref.71-64-00), mounted one in each intake in the sidewall above the spill door, position the spill doors in response to control signals from the AICUs or from the spill door manual inching switches. Each actuator consists of a piston jack with an integral dual-controlled servo-valve and is powered from either a main or a standby hydraulic system, via unlock valves, and is controlled by either an A or B control lane.

The actuator is locked when hydraulic pressure is removed, by means of the selector valves in each of the two lines to the jack chamber. A lock test facility enables the lock



No.1 Intake Pressure Ratio
Error Indication - Simplified Schematic
Figure 014

to be tested on the ground.

13. Selector Valve (Ref. Fig. 009)

Eight hydraulic selector valves (Ref. 71-62-12), two mounted within the sidewall structure of each intake, effect control of the main and standby hydraulic supplies to each spill door actuator.

Each selector comprises a main slide valve which is actuated by a solenoid-controlled pilot valve.

Hydraulic power is made available to the spill door actuators when the solenoid is energized.

This selector enables a faulty system to be isolated if a rupture is sustained by the AICS hydraulics, thus affording protection of the aircraft hydraulic systems.

Provision is made at each selector valve for the fitment of locking pins to prevent movement of the spill door

actuator when the aircraft is on the ground, thus preventing inadvertent movement of the spill door. The locking pins retain the selector valves in the de-energized position and are installed as detailed in 71-62-00, Servicing.

14. Ramp and Spill Door Position Resolver (Control and Monitor) (Ref. Fig. 009)

Sixteen ramp position resolvers are provided as an integral part of the ramp actuators. Four resolvers in each intake operate in pairs (control and monitor), one pair being associated with the A control lane and the other pair with the B control lane. The outputs of the resolvers, analogue control and monitor signals, are directly related to the ramp position and are applied to the associated AICUs.

Sixteen spill door position resolvers are provided on the spill door mechanisms. Four resolvers in each intake operate in pairs (control and monitor), one pair being associated with the A control lane and the other pair with the B control lane. The outputs of the resolvers, analogue control and monitor signals, are directly related to the spill door position and are applied to the associated AICUs.

The resolvers in each of the eight control lanes are separately supplied from eight 115/26 V 400 Hz transformers (Ref. Fig.007 and 008), one for each control lane, thus preventing common mode interference problems. The 115 V primary of each transformer is supplied in parallel with the input to the AICU to which it relates.

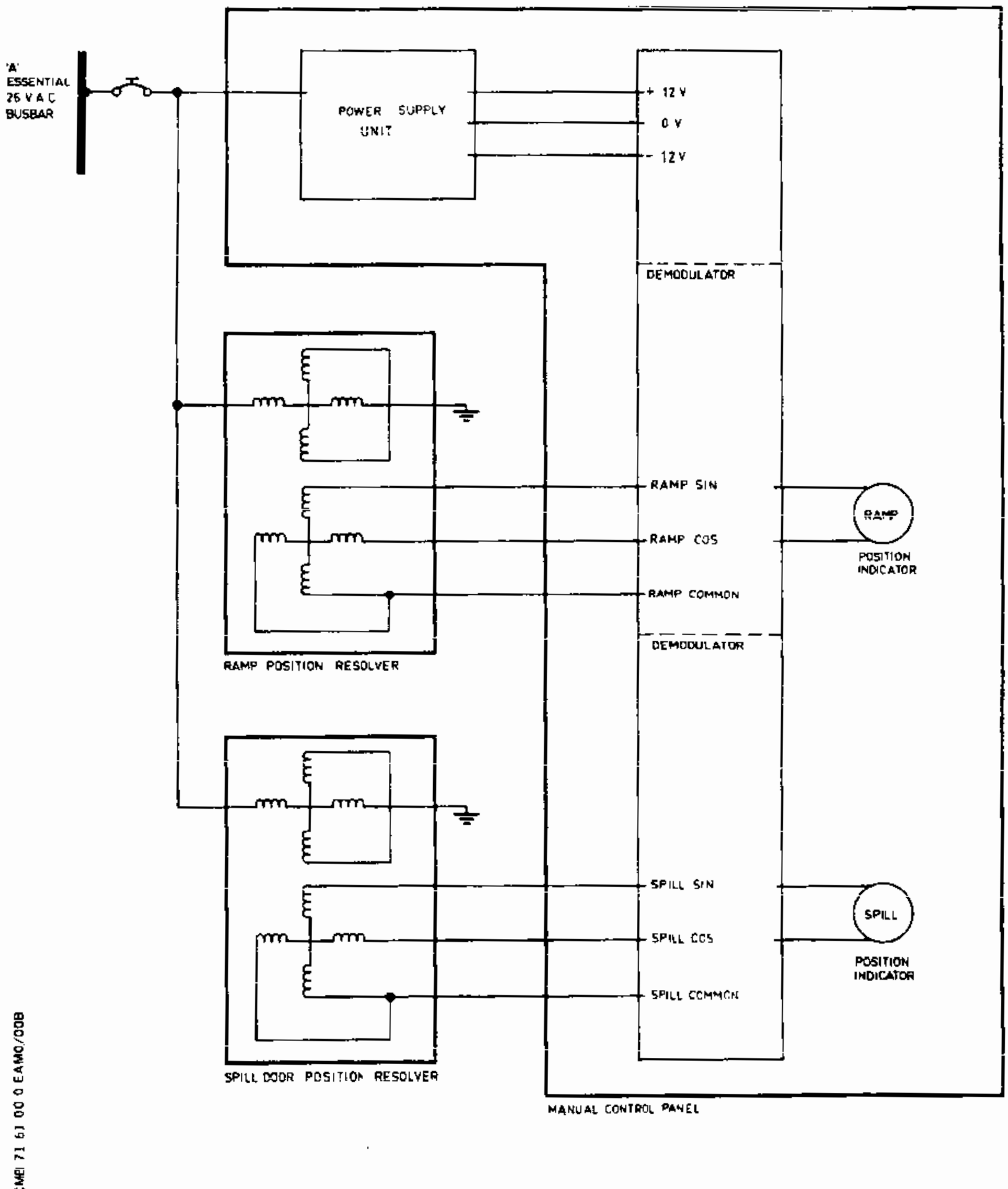
15. Ramp and Spill Door Position Resolver (Indication) (Ref. Fig.009 and 015)

Four ramp position resolvers, one operated by the ramp torque tube in each intake, and four spill door position resolvers, one operated by the spill door in each intake, apply position signals, via demodulators, to ramp and spill door position indicators mounted on the MCP.

Each of these resolvers is supplied with a 26 V a.c. 400 Hz reference supply from the aircraft 26 V a.c. essential busbars.

16. Auxiliary Inlet Position Microswitch (Ref. Fig. 009)

Eight auxiliary inlet position microswitches, two operated by the auxiliary inlet in each spill door, apply fully-open or fully-closed signals to auxiliary inlet position magnetic indicators on the ACP.



- No.1 Intake Ramp and Spill Door Position
Indication - Simplified Schematic
Figure 015

17. Angle of Incidence Sensor (Ref. Fig. 016)

Two angle of incidence sensors (LH and RH) (Ref. Chap.34) supply angle of incidence signals to the AISUs, Nos.1 and 2 AISUs being supplied by the LH sensor (No.1) and Nos.3 and 4 by the RH sensor (No.2).

Since there are only two incidence sources, certain constraints are imposed in the case of failure. With the loss of incidence information a fixed value of 3.5 deg is used in all channels.

Each sensor contains a centre-tapped potentiometer which provides analogue signals of positive and negative incidence directly proportional to the amount. Each potentiometer is supplied with a reference voltage from the aircraft 26 V a.c. busbars.

18. Engine Pulse Probe (Ref. Fig. 017)

Four engine pulse probes (Ref. Chap.71), one associated with each engine, supply engine low pressure compressor speed signals to the AICUs. Each pulse probe provides two outputs, N1A and N1B, which are analogue signals proportional to the engine low pressure compressor speed.

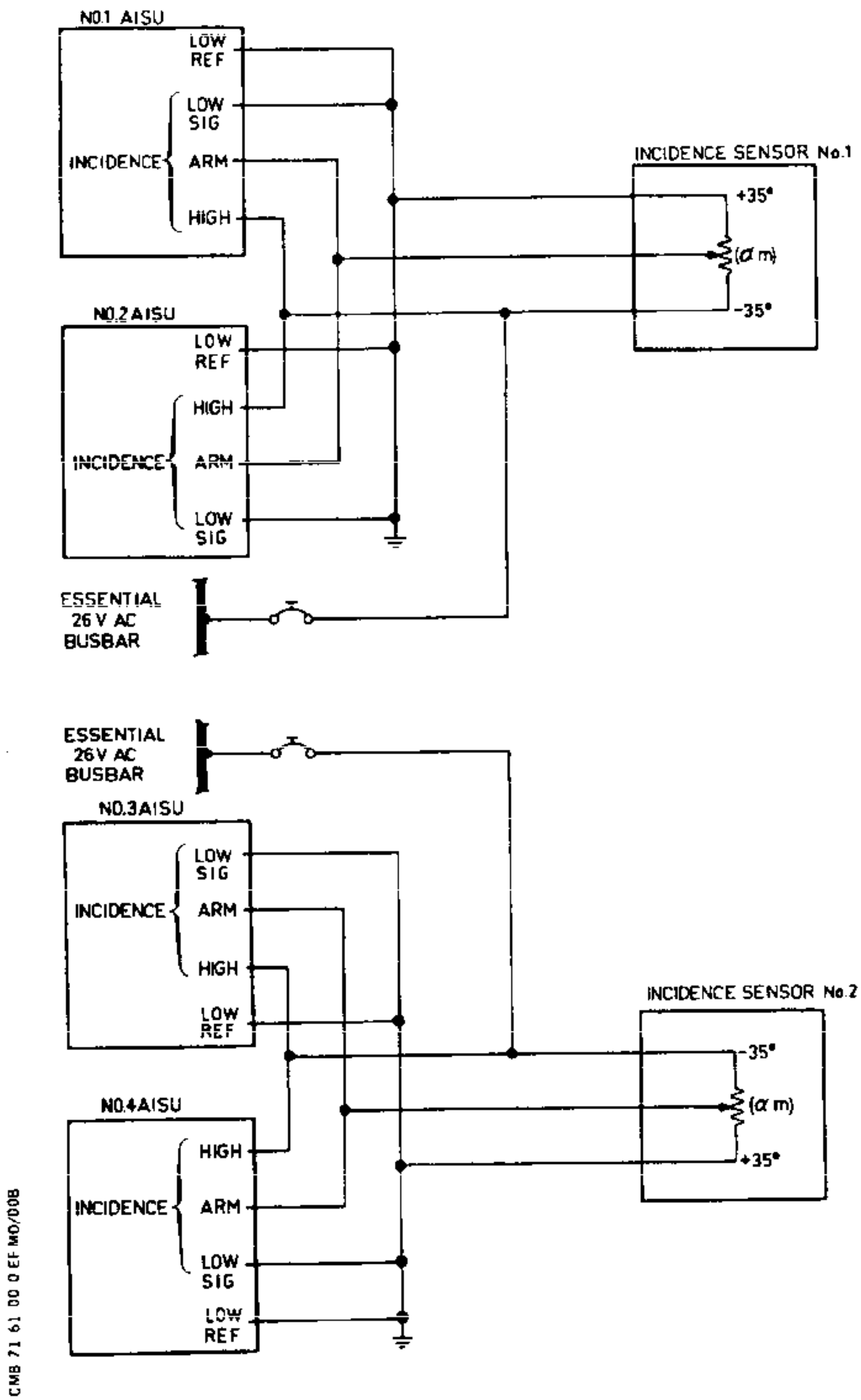
19. Manual Inching Potentiometer (Ref. Fig. 007, 008 and 020)

Thirty-two manual inching potentiometers, sixteen spill door and sixteen ramp, are housed within four interface units on the rear equipment racking and are accessible from the rear freight hold. Each potentiometer, in conjunction with a series resistor, enables the rate of movement of the associated ramp or spill door actuator to be accurately set when the actuators are directly operated by the appropriate ramp or spill door manual inching switch.

20. Interface Units (Ref. Fig.007 and 008)

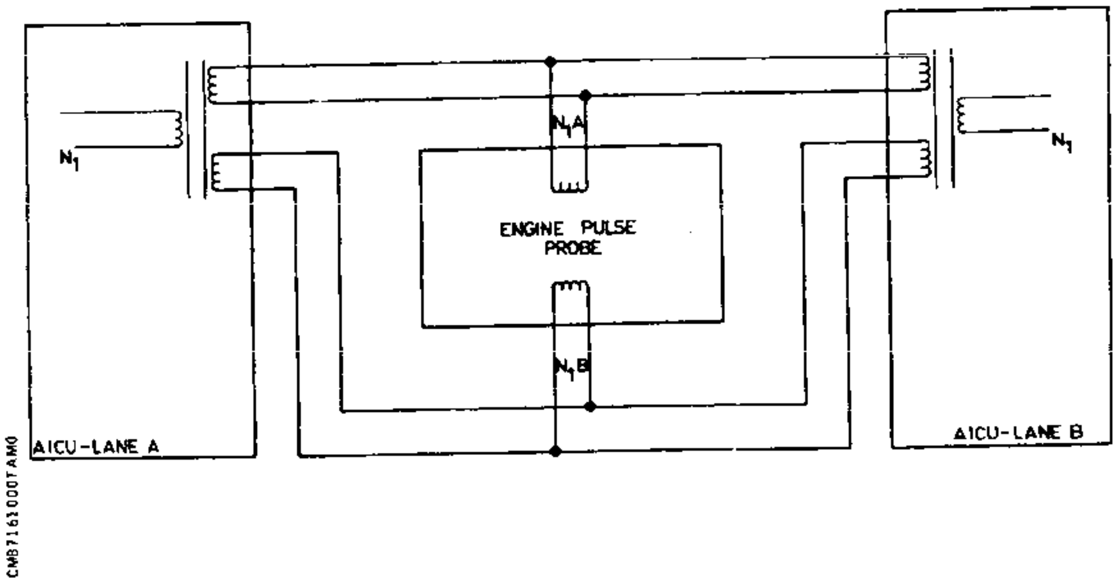
The majority of the system control relays for each intake are mounted on five plug-in component boards, two designated X, two designated Y and one designated Z.

These boards are housed in four interface units (IFUs) (IFU 1 lanes 1A and 2B, IFU 2 lanes 2A and 1B IFU 3 lanes 3A and 4B, IFU 4 lanes 4A and 3B), on the rear equipment racking, zones 243 and 244, and can be removed with the interface units in situ. The boards are positioned in the interface unit in guideways, each board mating with a particular fixed connector fitted on the forward face. Access



- Angle of Incidence Control Signals -
Simplified Schematic
Figure 016

R



- Engine Low Pressure Compressor Speed No.1 Intake -
Simplified Schematic
Figure 017

to the boards is gained by opening a panel on the rear face. A list of the individual relays and the associated control functions is given below:

Control Lane A

Board X - Relays annotated (A) are associated with control lane A.

Relay RL1(A) - Lane A disengage

Relay RL2(A) - Lane A select

Relay RL3(A) - Lane A mode select

Relay RL4(A) - Drive manual/auto, main hydraulics

Relay RL5(A) - Ramp standby/main hydraulics

Relay RL6(A) - Lane A start

Board Y - Relays annotated (M) are associated with the main hydraulic system.

Relay RL1(M) - Door select

Relay RL2(M) = Ramp select

Relay RL4(M) - Main hydraulics deselect

Relay RL5(M) - Ramp/door fail

Relay RL6(M) - Main hydraulic select

Relay RL7(M) - Manual/auto

Relay RL8(M) - Main hydraulics selected and pressurized

Control Lane B

Board X - Relays annotated (B) are associated with control lane B.

Relay RL1(B) - Lane B disengage

Relay RL2(B) - Lane B select

Relay RL3(B) - Lane B mode select

Relay RL4(B) - Drive manual/auto standby hydraulics

Relay RL5(B) - Ramp main/standby hydraulics

Relay RL6(B) - Lane B start

Board Y - Relays annotated (S) are associated with the standby hydraulic system.

Relay RL1(S) - Door select

Relay RL2(S) - Ramp select

Relay RL4(S) - Standby hydraulics deselect

Relay RL5(S) - Standby hydraulics low level

Relay RL6(S) - Standby hydraulics select

Relay RL7(S) - Manual/auto

Relay RL8(S) - Standby hydraulics selected and pressurized

Board Z - Relays annotated (C) are common to lanes A and B.

Relay RL1(C) - Pressure ratio error indication

Relay RL2(C) - Lock test

Relay RL4(C) - Engine handling signals

Relay RL5(C) - Auto N1 reduce control signals

In addition, eight control unit deselect delay relays are mounted on the four interface units, two on each unit. Each relay controls the operation of a control unit deselect relay in the associated AICU (Ref. para.3.).

The delay relay is normally de-energized, its operation being initiated whenever an AICU processor failure is detected. Provided the failure is sustained for a period in excess of 0.5 s the delay relay is energized when the delay time is exceeded to effect control of the AICU control unit deselect relay which, in turn, initiates de-selection of the lane in use.

21. Master Warning Signals

Warning signals to the associated master warning system (MWS) (amber) (Ref. 33-15-00) are initiated whenever a system failure is indicated by illumination of one or more of the following captions.

(1) N1

(2) Alpha Symbol

(3) HYD

(4) AUTO N1 REDUCE (Ref. Chap.71)

Warning signals to the amber MWS are also given if a failure of either lane occurs in the auto change mode, but with either lane A or lane B selected, only a failure of the selected lane will give such a signal.

R

Additional warning signals to the master warning system (red) (Ref. 33-15-00) are initiated when all automatic control of an intake is lost, indicated by illumination of a red INT failure caption, and when an intake is set to

manual control. In addition, when the AITU is selected on the ground the red master warning system is activated.

R The red master warning system is also activated when an AICS GROUND - FLIGHT switch is set to GROUND.

22. Hydraulics Supply Signals

The following signals are provided for the AICS by pressure switches (Ref. 71-62-31) and level switches (Ref. Chap.29), in the hydraulic system.

SIGNAL	HYDRAULIC SUPPLY	INTAKE
Low level (main)	Green reservoir Blue reservoir	1 and 2 3 and 4
Low pressure (main)	Green reservoir Blue reservoir	1 and 2 3 and 4
Low level (standby)	Yellow reservoir	1, 2, 3 and 4
Low pressure (standby)	Yellow reservoir	1, 2, 3 and 4

Hydraulics Signals
Table 1

Selection of the standby (yellow) hydraulic system by the AICS is also accompanied by a 'yellow hydraulics on' signal to the hydraulic system to initiate operation of the yellow hydraulic system.

23. Data Highway

Two data highways are used in the AICS; one, designated the control highway, carries the data from the AISUs to the AICUs, and the other, designated the test highway, links the AITU to the AISUs and to the AICUs, and carries a two-way data stream - to the AISUs during the pre-flight check and from the AICUs for equipment failure analysis during the pre-flight check and in-flight.

The control highway consists of two screened twisted pairs of cable; one pair carries data and the other pair carries power for the AICU receiver interface circuits, via optical couplers, which electrically isolate the AICUs from the

control highway.

The test highway consists of four screened twisted pairs of cable and carries clock, address, data and power for interface receivers in each AISU and each AICU. Optical couplers electrically isolate these units from the test highway.

24. Manometrics Input Signals, Total and Static Pressures (Ref. Fig. 004)

The manometrics input signals, total and static pressures, are obtained from the aircraft air data control system (Ref. Chap.34). As this system employs only three pitot/static probes, left-hand, right-hand and nose, and the AICS requires four sources of air data, the right-hand probe provides two inputs.

25. Operation

A. Control and Indication (Ref. Fig. 010, 011 and 012)

R The AICS controls and indicators, with the exception of the pressure ratio error indicators, are contained on the auto control and manual control panels; additional test controls and equipment failure indicators are contained on the test panel.

R Four guarded pre-flight check arming switches, one for each intake, designated AICS GROUND - FLIGHT, are mounted on the RAM AIR TURBINE test panel. In the FLIGHT position each switch inhibits selection of the pre-flight check test circuits; in the GROUND position the inhibition is removed.

A summary, given in Tables 2, 3 and 4, provides a brief functional description of each item on the ACP, MCP and AITP, together with its designation. The pressure ratio error indicators are mounted on a separate panel immediately above the ACP.

ITEM	DESIGNATION	FUNCTIONAL DESCRIPTION
Incidence signal failure caption (amber)	Alpha (Greek symbol) FAIL	When illuminated, indicates loss of incidence signal in all four intakes, or a single lane.

ITEM	DESIGNATION	FUNCTIONAL DESCRIPTION
Engine low pressure compressor speed signal failure captions (amber)	N1 SIG	When illuminated, indicate loss of N1 signal in the selected lane.
Intake failure captions (red)	INT	When illuminated, indicate loss of automatic control of the related intake.
Lane in use indicator lamps (green)	A	When illuminated, indicate lane A in use.
Lane in use indicator lamps (green)	B	When illuminated, indicate lane B in use.
Lane failure captions (amber)	LANE A	When illuminated, indicate a failure of lane A.
Lane failure captions (amber)	LANE B	When illuminated, indicate a failure of lane B.
Lane selector switches (rotary 4-way)	LANE	Normal in-flight setting is at AUTO A or AUTO B, allowing automatic lane change from lane A to lane B or vice-versa. A and B positions allow the appropriate lane to be manually selected.
Hydraulics failure captions (amber)	HYD	When illuminated, indicate failure of the selected hydraulic system or actuator.
Hydraulics selector switches (toggle, 3-way, lever-locked)	HYD	Normal in-flight setting is at AUTO, allowing automatic change-over to yellow standby system. YELLOW position is used

ITEM	DESIGNATION	FUNCTIONAL DESCRIPTION
		to acknowledge main hydraulic failure and cancel associated HYD failure caption. GREEN or BLUE positions are used in attempt to restore main system if yellow system subsequently fails.
Auxiliary inlet position magnetic indicators	AUX INLET	Display the position, OPEN or SHUT, of the auxiliary inlet in each intake. Diagonal stripes are displayed when the inlet is being opened or closed.
Manual or automatic mode selector switch (toggle, 2-way, guarded in 'off' position)	RAMP - SPILL MASTER	Normally set to AUTO, allowing automatic control of the ramps and spill doors. Set to MAN after an intake control failure, to allow ramps and spill door positions to be manually adjusted. This facility is also available during ground servicing.

Controls and Indicators - ACP
Table 2

ITEM	DESIGNATION	FUNCTIONAL DESCRIPTION
Ramp position indicators (calibrated 0 to 100%)	RAMP	Display position in each intake

ITEM	DESIGNATION	FUNCTIONAL DESCRIPTION
Ramp manual inching switches (toggle, 3-way, spring return to 'centre-off')	RAMP	Allow direct control of intake ramps when RAMP - SPILL MASTER switches are set to MAN.
Spill door position (calibrated 0 to 100%)	SPILL	Display spill door position in each intake.
Spill door manual inching switches (toggle, 3-way, spring return to 'centre-off')	SPILL	Allow direct control of intake spill doors when RAMP - SPILL MASTER switches are set to MAN.

Controls and Indicators - MCP
Table 3

ITEM	DESIGNATION	FUNCTIONAL DESCRIPTION
Pre-flight check (PFC) selected warning caption (red)	ON	Illuminated when PFC ON - OFF switch is set to ON.
Pre-flight check (PFC) status caption (green)	GO	Illuminated when a PFC satisfactorily completed.
Pre-flight check (PFC) status caption (yellow)	HOLD	Illuminated when AITU sequencer is holding its programme because of a failure detection.
Pre-flight check (PFC) status caption (yellow)	FAIL	Illuminated when a PFC is completed if a failure condition has been detected during the test sequence.

ITEM	DESIGNATION	FUNCTIONAL DESCRIPTION
Engine speed term (N1) required caption (yellow)	N1 REQD	When illuminated indicates that the aircraft engines are not running and that N1 probes cannot be checked.
Green hydraulics required caption (yellow)	CHK HYD	Only illuminated at the beginning of a PFC if one of the green, blue or yellow hydraulic systems is depressurized.

NOTE: The AITU may contain a, GN/Y REQ caption legend instead of the CHK HYD caption described in table 4. Either legend is satisfactory in this position as they provide equivalent information during the test sequence.

Although interchangeable CHK HYD is the preferred legend and should be fitted when replacement is necessary.

ITEM	DESIGNATION	FUNCTIONAL DESCRIPTION
Blue Hydraulic required Caption (yellow)	B/Y REQD	Illuminated at a certain point in the PFC when it is required to depressurize the green system and pressurize the blue/yellow system
Caption	SET HYD	Not used.
Pre-flight check selector switch (toggle, 2-pole, 2-way, normally guarded at OFF)	INTAKE TEST ON - OFF	When set to ON, provided that the associated weight switch is operated (aircraft on ground), arms the pre-flight check circuit and activates the master warning system (red).
Pre-flight check reset switch (toggle, 2-pole, 2-way)	INTAKE TEST RESET - OFF	When set to RESET, the AITU s sequencer and test panel captions are reset after failure analysis.
Pre-flight check continue switch (toggle, 2-pole, 2-way)	INTAKE TEST CONTINUE - OFF	When set to CONTINUE starts the pre-flight check program and subsequently provides a manual override to cancel a failure HOLD condition or to allow the AITU sequencer to continue the test program after a CHK HYD, B/Y REQD or

ITEM	DESIGNATION	FUNCTIONAL DESCRIPTION
		N1 REQD condition.
Unit failure captions (white)	SU1, SU2, SU3 and SU4	When illuminated, indicate a failure of the associated AISU.
	CU1, CU2, CU3, CU4, CU5, CU6, CU7 and CU8	When illuminated, indicate a failure of the associated AICU.
	PV1, PV2, PV3, PV4, PV5, PV6, PV7 and PV8	When illuminated, indicate a failure of the associated ramp void absolute pressure sensor or its monitor.
	RA1, RA2, RA3 and RA4	When illuminated, indicate a failure of the associated ramp actuator.
	SA1, SA2, SA3, and SA4	When illuminated, indicate a failure of the associated spill door actuator.
	RP1, RP2, RP3 and RP4	When illuminated, indicate a failure of the associated ramp position pick-off/ resolver.
	SP1, SP2, SP3 and SP4	When illuminated, indicate a failure of the associated spill door position pick-off resolver.
	N1-1, N1-2, N1-3 and N1-4	When illuminated, indicate a failure of the associated engine low speed compressor signal.
	Alpha (Greek symbol)	When illuminated, indicates a failure of an incidence sensor.

ITEM	DESIGNATION	FUNCTIONAL DESCRIPTION
AITU sequence pattern failure captions (white)	1, 2, 4, 8, 16 and 32	When illuminated, indicate the position of the AITU sequence pattern during failure holds.

Controls and Indicators - AITP
Table 4

B. Functional Description

(1) Intake Control Principles
(Ref. Fig. 001, 004 and 005).

The ramp is the primary spill device and is used to control the intake capture area and consequently the ramp void pressure. The allowable ramp angle varies with local mach number, incidence and spill door angle, and both maximum and a minimum ramp angle are defined to maintain the air flow distortion at the engine face acceptable to the engine, and Eta-V within the Eta-V schedule. At low temperatures, as the temperature decreases, the ramp equalizes Eta-V and Eta-V Sched. by moving progressively toward the ramp minimum limit (Delta 2 min), and the N1/square root of theta local mach number schedule reduces the engine mass-flow demand as temperature falls to ensure that the terminal shock remains in a satisfactory position. The ramp should only achieve Delta 2 min transiently during high rate temperature disturbances.

At average temperatures, Eta-V and Eta-V Sched. are equalized by the ramp operating between the ramp minimum and maximum limits with the spill door closed.

At high temperatures, as the temperature increases, the ramp equalizes Eta-V and Eta-V Sched. by moving progressively toward the ramp maximum limit. When this limit is reached further increase in temperature would cause the intake airflow to exceed the engine requirements and it is necessary to open the spill door to increase the spillage. Opening of the spill door also modifies the ramp

maximum limit and allows increased ramp travel, relative to spill door angle, whilst still maintaining a satisfactory airflow to the engine.

At low incidence the Eta-V Sched. is modified to maintain satisfactory flow distortions.

(2) Ramp and Spill Door Control (Ref. Fig.004 and 005)

Power is applied to the AICS when power is made available on the aircraft distribution busbars, and either an A or a B control lane is selected in the automatic mode, as determined by the position of the LANE selector switch, to effect control of each intake.

At take-off and at low air speeds the ramps are fully up and the spill doors closed. During take-off the landing gear is raised, open-circuiting an associated weight services relay. Contacts of the relay open-circuit the supply line to the AITP INTAKE TEST ON - OFF switch, thereby ensuring that the pre-flight check cannot be effected during flight. In flight above 1.3 M at normal operating ambient temperature, as the airspeed is increased Eta-V diverges from Eta-V Sched. and a control error signal is produced in each AICU. This signal is applied as follows:-

(a) Via a ramp compensation circuit to a limit circuit which sets the ramp maximum and minimum limits, and provides a ramp drive signal. This signal is then summed with a ramp position feed-back signal and the resulting signal is applied to the ramp actuator servo-amplifier. The output from the servo-amplifier operates the ramp servo-valve which, in turn, operates the ramp actuator to move the ramp to the demanded position. Moving the ramp changes the ramp position feedback signal and when the demanded ramp angle is achieved the ramp drive signal and the ramp position feedback signal are nulled, with Eta-V equal to Eta-V Sched. As the airspeed is increased this process continues and the ramp is progressively lowered. Conversely, when the airspeed is decreased, Eta-V diverges from Eta-V Sched. in the opposite sense, and the control error signal is decreased which, in turn, decreases the ramp drive signal below the level of the ramp

position feedback signal and the polarity of the input signal to the ramp actuator servo-amplifier is reversed. The resulting output reverses the ramp servo-valve thus causing the ramp to be raised until the decreasing ramp position feedback signal again becomes nulled by the control error signal.

(b) Via a spill door response compensation circuit to a limit circuit where it is summed with a ramp limit and spill door schedule. The output signal, spill door drive, is then summed with a spill door position feedback signal and the resulting servo-valve signal, which with position feedback signal equal to zero is sufficient to hold the spill door closed against aerodynamic loads, is applied to the spill door actuator servo-amplifier. The output from the servo-amplifier operates the spill door servo-valve which, in turn, operates the spill door actuator to hold the spill door in the closed position.

At high ambient temperatures the ramp maximum limit is reached before control of the intake airflow is achieved. In this condition the control error signal increases above the limit imposed by the spill door control schedule, thus reversing the polarity of the spill door drive signal and causing the servo-valve to reverse the operation of the spill door actuator. The spill door is then opened until the spill door drive signal is nulled by the increasing spill door position feedback signal. Opening the spill door allows excess air to be spilled from the intake and, in addition, produces a control signal which increases the ramp maximum limit and allows the ramp to be lowered to a position directly related to spill door angle, thus maintaining a satisfactory airflow to the engine during high temperature operation. When the ambient temperature decreases, the control error signal is reduced and control is effected as follows:-

(a) The spill door drive signal falls below the level of the spill door position feedback signal, the polarity of the input signal to the spill door actuator servo-amplifier is reversed and the spill door is moved toward the closed position. Movement of the door continues until the spill door position feedback signal is again nulled by the spill

door drive signal. When the closed position is reached the spill door drive signal is reduced to zero but the spill door position feedback signal continues to apply an offset voltage input to the spill door actuator servo-amplifier; this input maintains the spill door closed.

(b) The ramp maximum limit is also reduced which, in turn, reduces the ramp drive signal and the ramp is raised by the ramp position feedback signal until the signal is again nulled by the ramp drive signal. When the normal ambient operating temperature is reached the ramp operates independently of the spill door as previously described.

During extreme conditions of incidence the control value of Eta-V is modified to improve the intake airflow.

If the ambient temperature falls below the normal operating range, Eta-V falls below Eta-V Sched., the ramp is raised and the engine mass flow requirements are reduced by lowering the engine low pressure spool speed to ensure that Eta-V does not fall below Eta-V min.

In addition, a separate engine low pressure spool speed signal is also applied to the spill door control circuits downstream of the ramp limit and spill door schedule. This signal is applied if the engine speed suddenly falls, and allows excess air to be dumped by momentarily opening the spill door.

(3) Hydraulic Systems - Control No.1 Intake (Ref. Fig.018 and 019)

NOTE: Control of the hydraulic systems for intakes 2, 3 and 4 is similar.

The control of hydraulic selection relays RL1, RL2 and RL4 (main (M) and standby (S)) is effected by transistor switches (not illustrated), included in the earth return circuit of each relay, and a 28 V d.c. coil supply. Application of the coil supply places the relays in a state of readiness (armed) and the relays are subsequently energized by a control signal being applied to the transistor switches.

(a) Selection of Hydraulic Systems in Automatic Control Mode

Selection of the hydraulic system in the automatic control mode is effected by placing the RAMP - SPILL MASTER switch and the hydraulic selector switch at the AUTO positions.

When the RAMP - SPILL MASTER switch is set to AUTO -

a1) relays RL7(M) and RL7(S) are energized,

a2) relays RL4(M) and RL4(S) are armed,

a3) part of the automatic change-over circuit of relay RL6(S) is completed, and

a4) an inhibit signal is removed from the hydraulic failure relay (RLA).

Energization of relay RL7(M) isolates the RAMP and SPILL manual inching switches associated with the main hydraulic system (Ref. Fig. 020) and arms relays RL1(M) and RL2(M) which are then controlled by a 28 V supply from relay RL4(M) and a ramp/door select signal input from the selected control lane (Ref. Fig. 024). In addition, part of the supply line to main hydraulic select relay RL8(M) is completed.

Energization of relay RL7(S) isolates the RAMP and SPILL manual inching switches associated with the standby hydraulic system (Ref. Fig. 020) and arms relays RL1(S) and RL2(S) which are then controlled by a 28 V supply from relay RL4(S) and a ramp/door select signal input from the selected control lane (Ref. Fig. 024). In addition, part of the supply line to standby hydraulic select relay RL8(S) is completed and the manual mode controlling supply is removed from relay RL6(s).

The AUTO position of the HYD selector switch effects controls as follows:-

a1) A supply is applied - via normally-closed contacts of PFC relay RLC2, which enables the main hydraulics to be automatically reset during the pre-flight check procedure - to energize

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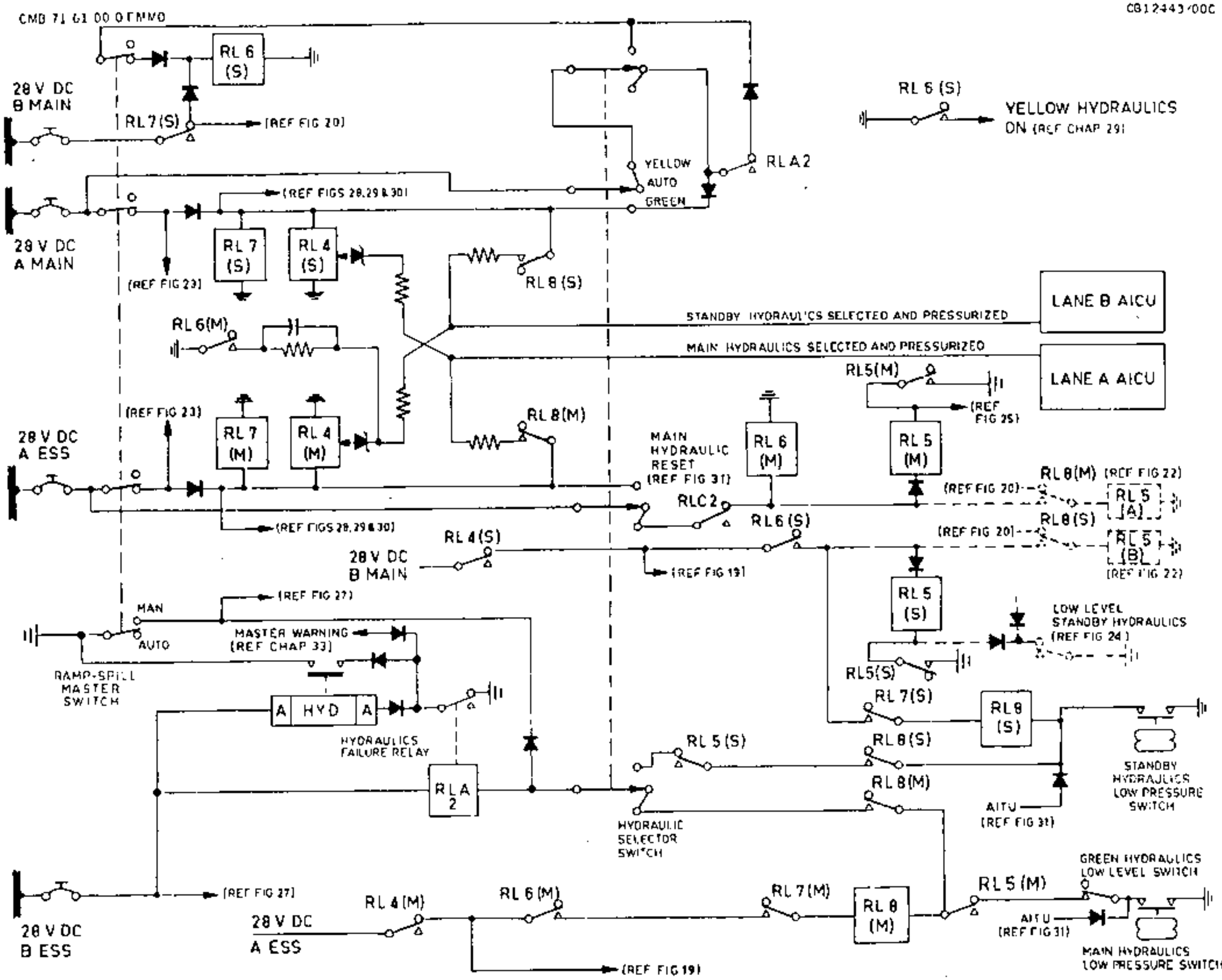

- Manual and Auto Hydraulics Selection -
Simplified Schematic
Figure 018

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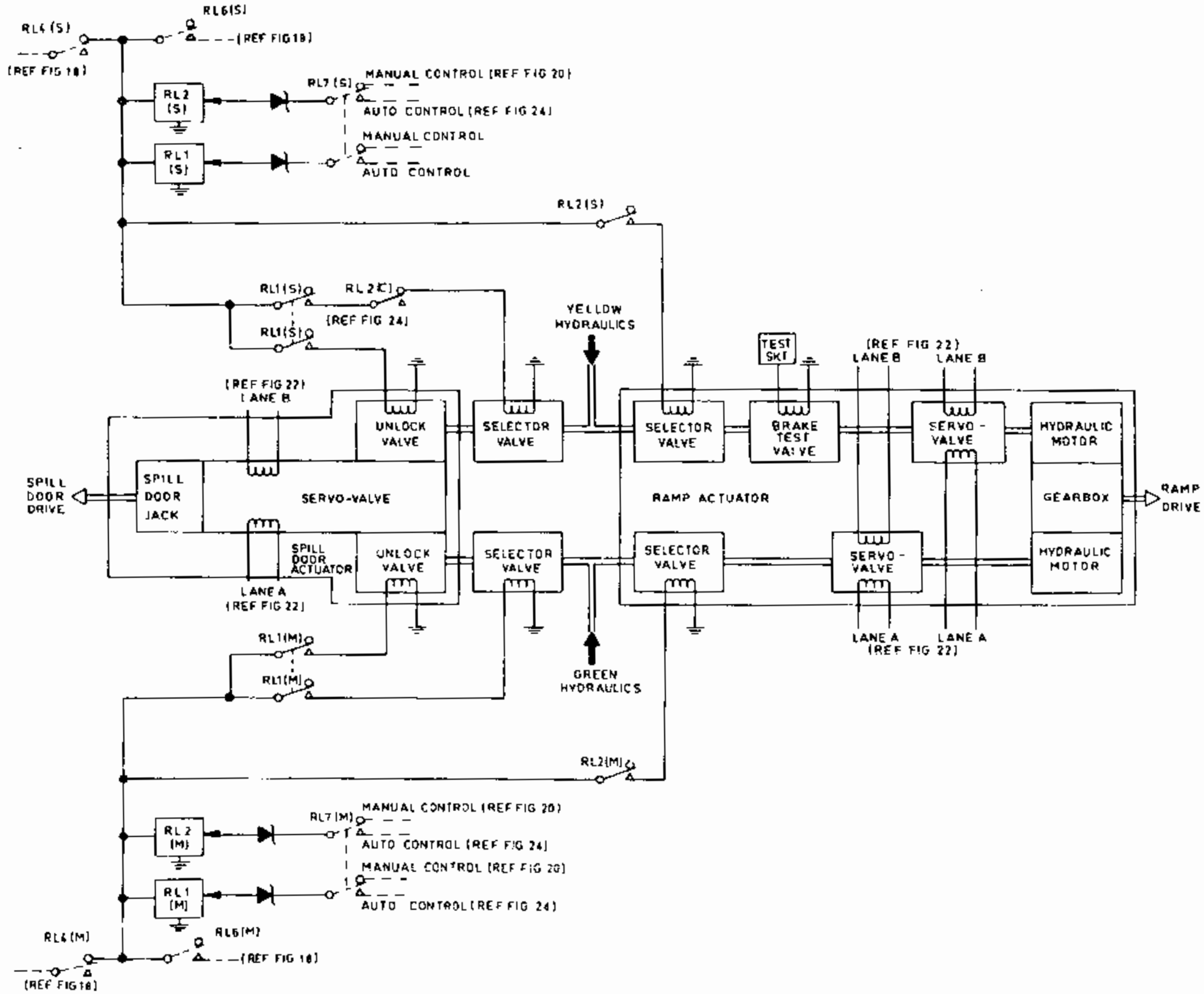

- Ramp and Spill Door Actuators Hydraulic Selection -
Simplified Schematic
Figure 019

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hydraulics select relay RL6(M) and to arm ramp/door fail relay RL5(M). Energization of relay RL6(M) arms relay RL8(M) via de-energized relay RL4(M) and energized relay RL7(M) and connects a delay circuit to relay RL4(M). This delay ensures that, when power is applied to the system with the automatic mode selected and both hydraulic systems pressurized, the main (green) hydraulic system is selected, i.e., relay RL4(S) becomes energized before relay RL4(M). Provided that the main green hydraulics system is serviceable, i.e., low pressure and level switches closed, and that ramp and/or spill failure signals are not present in the controlling control lane, i.e., relay RL5(M) de-energized, then relay RL8(M) is energized.

a2) When energized, relay RL8(M) energizes relays RL5(A) and RLA, arms the start and hold-on circuit of control lane A (Ref. Fig. 023), applies a control signal to energize relay RL4(S) and provides a 'main hydraulics selected and pressurized' signal to the lane A AICU.

a3) When energized, relay RLA extinguishes the HYD failure warning caption and interrupts the automatic selection circuit for relay RL6(S).

a4) Energization of relay RL4(S) inhibits operation of relays RL1(S), RL2(S), RL5(S) and RL8(S) and arms the start and hold-on circuit of control lane B (Ref. Fig. 023).

a5) When energized, relay RL5(A) enables the lane A ramp servo-valve drive signal to be applied to the main hydraulic servo-valve in the ramp actuator (Ref. Fig. 022).

In this condition, the spill door and ramp actuators are hydraulically powered from the main (green) hydraulic system under the control of the selected lane. A subsequent failure of the main hydraulics, resulting in a ramp and/or door failure being sensed

by the controlling control lane, causes relay RL5(M) to be energized and latched after a delay of 150 ms (Ref. Fig. 025) as follows:-

a1) Control circuits connected in parallel, one for each associated AICU, effect control of relay RL5(M) and associated lane disengage relays RL1(A) and RL1(B).

a2) Each circuit comprises a 150 ms delay circuit which controls the operation of transistors VT2 and VT6 and an additional delay circuit of 10 ms - commencing at the switch-on point of VT2 and VT6 - which controls the operation of transistor VT3.

a3) In the quiescent state the base of VT2 is driven negative and the base of VT3 is driven positive and all three transistors are switched off and relay RL5(M) and the related relay RL1(A) or RL1(B) remain de-energized.

a4) On receipt of a ramp/door fail signal the 150 ms delay is commenced; on completion of the delay period the base of VT2 is driven positive, the transistor is switched on, which, in turn, switches on VT6 and commences the 10 ms delay for VT3. When VT2 and VT6 conduct, relay RL5(M) is energized and the transfer to the standby hydraulic system is initiated. Relay RL5(M) then remains electrically latched in the energized position; the latch is interrupted by setting the hydraulic selector switch to the YELLOW position.

a5) If the change-over of the hydraulic systems results in the removal of the ramp/door fail signal within the 10 ms delay period imposed on the operation of VT3, VT3 remains de-energized and control by the selected line is maintained.

a6) If the change-over fails to remove the ramp/door fail signal, the base of VT3

is driven negative, relay RL1(A) or (B) is energized and a lane change-over is initiated.

When energized, relay RL5(M) de-energizes relay RL8(M) and initiates the automatic change-over to the standby (yellow) hydraulic system as follows:-

a1) Relay RLA is de-energized which, in turn, illuminates the HYD failure warning caption and energizes relay RL6(S).

a2) Relay RL4(S) is de-energized.

a3) The 'main hydraulics selected and pressurized' signal is removed from the lane A AICU.

a4) Relay RL5(A)is de-energized, which enables the lane A ramp servo-valve drive signal to be applied to the standby hydraulic servo-valve in the ramp actuator (Ref. Fig. 022).

a5) The selected lane start and hold-on circuit is momentarily interrupted but the lane is not de-selected; a time delay maintains the lane select relay RL2(A) energized for approximately 40 ms, allowing the selected control lane start and hold-on circuit to be remade by acceptance of the standby hydraulic system, relay RL4(M) energized (Ref. Fig. 023).

a6) Contacts of relay RL5(M) ground the control signal to relay RL1(M) (Ref. Fig. 024) which, in turn, de-energizes the spill door actuator main hydraulic select and unlock valves, and the spill door is locked in position until the standby hydraulics effect control.

De-energization of relay RL4(S) completes part of the circuit to relays RL1(S), RL2(S), RL5(S), RL8(S) and RL5(B) and interrupts part of the start and hold-on circuit of control lane B (Ref. Fig. 023) to ensure that lane B cannot be selected in conjunction with

the now failed main hydraulic system.

Energization of relay RL6(S) applies a 'yellow hydraulics on' signal to the aircraft hydraulic control system, arms standby hydraulics low level relay RL5(S) and connects a supply to arm relay RL8(S). Provided that the standby hydraulics system is serviceable, i.e., low pressure switch closed, then relay RL8(S) is energized.

When energized, relay RL8(S) -

a1) applies a 'standby hydraulics selected and pressurized' signal to lane B AICU,

a2) energizes relay RL4(M),

a3) completes part of the standby hydraulics control line to relay RLA,

a4) completes part of the start and hold-on circuit of control lane B (Ref. Fig. 023), thus maintaining lane B 'in use' if lane B is controlling or, if not controlling, enabling lane B to be selected by the lane selector switch in conjunction with the standby hydraulic system only, and

a5) energizes relay RL5(B).

Energization of relay RL4(M) -

a1) inhibits operation of RL8(M) and main hydraulic relays RL1(M) and RL2(M), and

a2) completes part of the start and hold-on circuit of control lane A (Ref. Fig. 023), thus maintaining lane A 'in use' if lane A is controlling or, if not controlling, enabling lane A to be selected by the lane selector switch in conjunction with the standby hydraulic system only.

Energization of relay RL5(B) enables the lane B ramp servo-valve drive signal to be applied to the standby hydraulic servo-valve in the ramp actuator (Ref. Fig. 022).

In this condition, the HYD failure warning

caption is illuminated, an intake failure warning signal is applied to the master warning system (amber) (Ref. 33-15-00) and the intake is hydraulically powered by the standby hydraulic system under the control of the selected control lane. Selection of the HYD selector switch to the YELLOW position acknowledges the failure of the main hydraulic system, de-latches and inhibits energization of relay RL5(M), maintains relay RL6(S) energized and, provided that relay RL5(S) is de-energized, i.e., standby hydraulic system low level switch open, energizes relay RLA which, in turn, extinguishes the HYD failure caption and removes the intake failure warning signal from the amber master warning system.

Subsequent low pressure or low level of the standby hydraulic system effects control as follows:-

a1) Low standby hydraulic pressure opens the low pressure switch and de-energizes relay RL8(S) which, in turn, removes the standby hydraulics selected and pressurized signal from control lane B, de-energizes relays RLA and RL4(M), and interrupts the start and hold-on circuit of control lane B. De-energization of relay RL4(M) interrupts the start and hold-on circuit of control lane A.

Both lanes are now deselected and an intake failure relay RLD2 (Ref. Fig. 026) is energized (both lane-in-use inputs removed), which results in the INT failure caption being illuminated and an intake failure signal being applied to the master warning system (red) (Ref. 33-15-00). In this condition, the ramp and spill door actuators are locked in position and the intake control surfaces are 'frozen'.

De-energization of relay RLA causes the HYD failure caption to become illuminated and an intake failure signal to be applied to the master warning system (amber) (Ref. 33-15-00).

a2) Low level in the standby hydraulic

system with pressure maintained, i.e., low pressure switch and low level switch closed, inhibits operation of the spill door, by grounding the control signal to relay RL1(S) (Ref. Fig. 024), which prevents the spill door select and unlock valves from being energized and the spill door is locked in position; control of the ramp is maintained. In addition, the low level signal (earth) energizes relay RL5(S). Contacts of this relay latch the relay energized and interrupt the supply line to the hydraulics failure relay RLA, via the hydraulic selector switch YELLOW position. This action prevents the hydraulic failure caption being cancelled when the YELLOW position is selected.

If on failure of the green main hydraulic system a transfer to the yellow standby hydraulics is not effected, i.e., low pressure in the standby hydraulic system, then the failure of relay RL8(S) to energize, results in the loss of both control lanes which, in turn, results in the energization of relay RLD2 (Ref. Fig. 026) and the illumination of the red INT failure caption accompanied by the red master warnings.

(b) Manual Selection of Main (Green) Hydraulics with RAMP - SPILL MASTER SWITCH at AUTO

When the HYD selector switch is set to the GREEN position the main hydraulic system is selected as previously described in the automatic selection of the hydraulic systems, but the automatic change-over facility to the standby hydraulic system, initiated by energizing relay RL6(S) via contacts of relay RLA, is inhibited. Thus, if a subsequent failure of the main hydraulics occurs, energization of relay RL6(S) is prevented and both the HYD and the INT failure warning captions are illuminated, accompanied by failure signals to the master warning system (red and amber).

(c) Manual Selection of Standby (Yellow) Hydraulics with RAMP - SPILL MASTER Switch at AUTO

When the HYD selector switch is set to the YELLOW position the standby hydraulic system is selected by directly energizing relay RL6(S) and all subsequent operations are as previously detailed for an automatic change-over to the standby hydraulics system following a failure of the main hydraulics.

(d) Selection of Main (Green) or Standby (Yellow) Hydraulics in Manual Control Mode

The manual control mode in conjunction with the main hydraulics is initiated by placing the RAMP - SPILL MASTER switch in the MAN position with the HYD selector set to the GREEN or AUTO position. This action -

d1) inhibits the hydraulics automatic change-over facility by interrupting the control circuit of RL6(S),

d2) energizes relay RLA which inhibits the HYD failure warning caption, and

d3) inhibits selection of both control lanes thus initiating illumination of the red INT failure caption and the associated red master warnings.

Simultaneously -

d1) de-energized main hydraulics de-select relay RL4(M) applies a supply to arm door select relay RL1(M) and ramp select relay RL2(M),

d2) de-energized manual/auto relay RL7(M) places relays RL1(M) and RL2(M) under the control of the RAMP and SPILL manual inching switches (Ref. Fig. 020),

d3) de-energized standby hydraulics deselect relay RL4(S) remains de-energized and applies a supply to arm door select relay RL1(S) and ramp select relay RL2(S).

d4) manual/auto relay RL7(S) is energized which, in turn, prevents relay RL6(S) from energizing, thus preventing the 'yellow hydraulics on' signal from being given to the aircraft hydraulic system,

d5) control of relays RL1(S) and RL2(S) is removed from the RAMP and SPILL inching switches, thus preventing selection of the standby hydraulics ramp and door actuators selector valves and the spill door actuator unlock valve by these switches (Ref. Fig. 020), and

d6) main hydraulics select relay RL6(M) is also energized but has no effect on the system.

In this condition the main green hydraulic system is available for operation of the ramp and spill door actuators in conjunction with the RAMP and SPILL inching switches.

Subsequently, if the HYD selector switch is placed in the YELLOW position the standby hydraulic system is selected as follows:-

d1) Manual/auto relay RL7(S) is de-energized and places relays RL1(S) and RL2(S) under the control of the RAMP and SPILL manual inching switches (Ref. Fig. 020). In addition, a supply is applied to energize standby hydraulics select relay RL6(S).

d2) Energization of relay RL6(S) applies a 'yellow hydraulics on' request signal to the aircraft hydraulic control system (Ref. Chap.29).

d3) Manual/auto relay RL7(M) is energized which, in turn, interrupts the supply to the RAMP and SPILL manual inching switches associated with the main hydraulics (Ref. Fig. 020), thus preventing selection of the main hydraulics selector valves and servo-valves by these switches. In addition, control of relays RL1(M) and RL2(M) is removed from the RAMP and SPILL inching switches, thus preventing selection of the main hydraulics ramp and door actuator selector valves and the spill door actuator unlock valve by these switches (Ref. Fig. 020).

In this condition, the standby hydraulic system is available for operation of the

ramp and spill door actuators in conjunction with the RAMP and SPILL inching switches.

(4) Manual Inching Facility (Ref. Fig. 020)

The manual inching facility is made available by placing the RAMP - SPILL MASTER switch (Ref. Fig. 010) in the MAN position. In this position, operation of both control lanes is inhibited and relays RL4(A) and RL4(B) (Ref. Fig. 024) are de-energized and control is effected as follows:-

(a) When the HYD selector switch is set to the AUTO or GREEN positions, relay RL7(S) is energized and relay RL7(M) is de-energized which, in turn, energizes relay RL5(A), inhibits operation of the RAMP and SPILL inching switches associated with the standby hydraulics but allows control to be effected by the RAMP and SPILL inching switches associated with the main hydraulics as follows:-

a1) When the main hydraulics RAMP inching switch is selected to either the RAISE or the LOWER position, a supply is directly connected to energize relay RL2(M) (Ref. Fig. 019) (relay RL4(M) de-energized) and the ramp actuator main hydraulics selector valve is energized. This same supply is also applied, via contacts of relays RL4(A) (de-energized) and RL5(A) (energized), to the ramp actuator main hydraulics servo-valve which is then activated to cause the actuator to either raise or lower the ramp as determined by the direction of the input supply to the servo-valve.

a2) When the main hydraulics SPILL inching switch is selected to either the OPEN or the CLOSE position, a supply is directly connected to energize relay RL1(M) (Ref. Fig. 019) (relay RL4(M) de-energized) and the spill actuator main hydraulic selector valve and unlock valve are energized. This same supply is also applied to the spill actuator main hydraulics servo-valve

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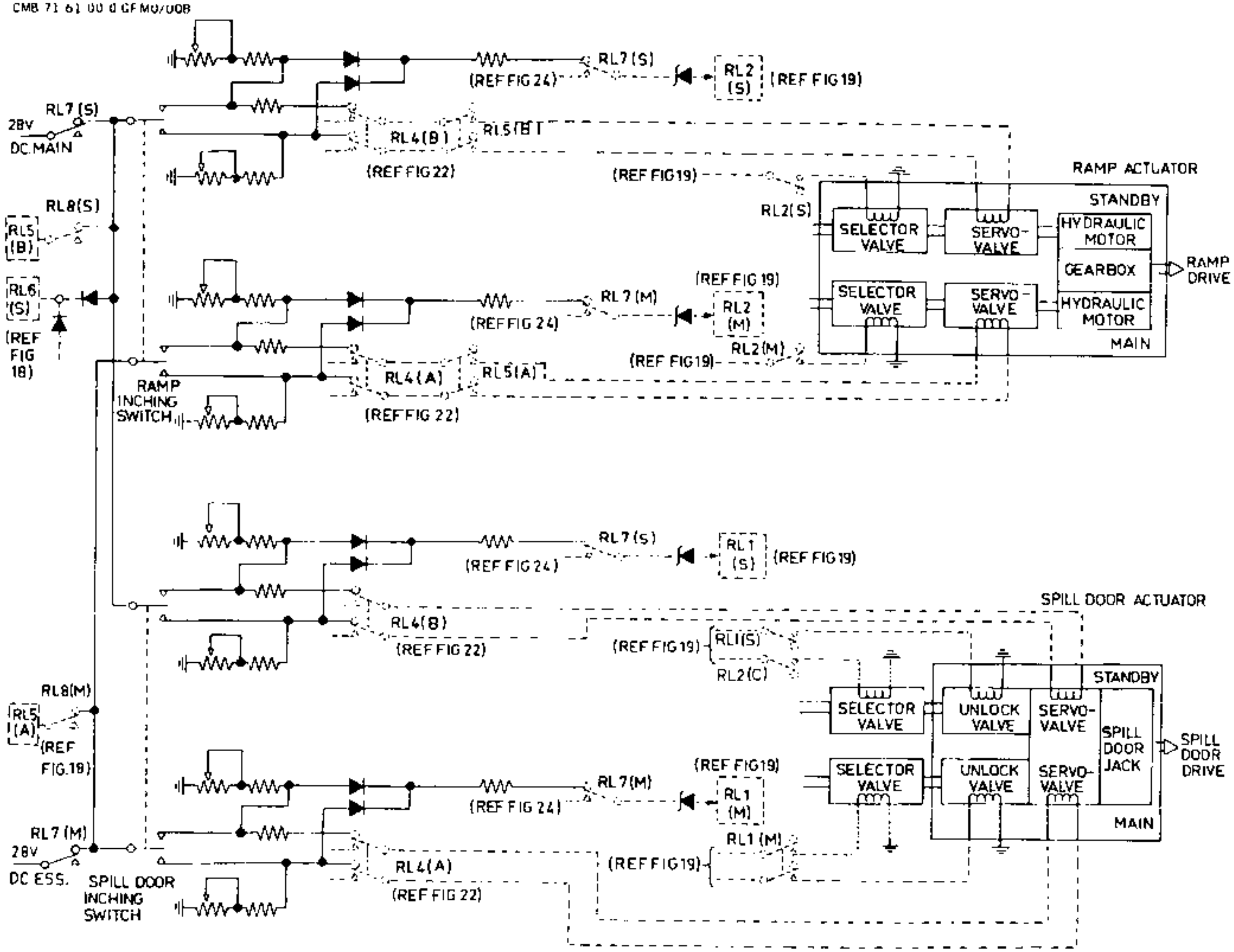

- Manual Inching - Simplified Schematic
Figure 020

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which is then activated to cause the spill actuator to either open or close the spill door as determined by the direction of the input supply to the servo-valve.

(b) When the HYD selector switch is set to the YELLOW position, relay RL7(S) is de-energized and relay RL7(M) is energized which, in turn, de-energizes relay RL5(A) and energizes relay RL5(B), inhibits operation of the RAMP and SPILL inching switches associated with the main hydraulics but allows control to be effected by the RAMP and SPILL inching switches associated with the standby hydraulics as follows:-

b1) When the standby hydraulics RAMP inching switch is selected to either the RAISE or the LOWER positions, a supply is directly connected to energize relay RL2(S) (Ref. Fig. 019) (relay RL4(S) de-energized) and the ramp actuator standby hydraulics selector valve is energized. This same supply is also applied, via contacts of relays RL4(B) (de-energized) and RL5(B) (energized), to the ramp actuator standby hydraulics servo-valve which is then activated to cause the actuator to either raise or lower the ramp as determined by the direction of the input supply to the servo-valve.

b2) When the standby hydraulics SPILL inching switch is selected to either the OPEN or the CLOSE position, a supply is directly connected to energize relaY RL1(S) (Ref. Fig. 019) (relay RL4(S) de-energized) and the spill actuator standby hydraulics selector valve and unlock valve are energized. This same supply is also applied to the spill actuator standby hydraulics servo-valve which is then activated to cause the spill actuator to either open or close the spill door as determined by the direction of the input supply to the servo-valve.

Manual inching potentiometers in each ramp and

spill actuator manual control circuit can be manually adjusted to control the servo-valve current, thus setting the required rate of actuator movement.

When in the manual control mode the red INT failure caption is illuminated and a red master warning is given; operation of all other failure captions is inhibited.

(5) Lane Selection - Control (Ref. Fig. 022, 023 and 024)

Control of the intakes by a selected control lane is initiated when the RAMP - SPILL MASTER switches are placed in the AUTO position (Ref. Fig. 018). The controlling lanes are then determined by the lane selector switches and, when in the AUTO positions, by automatic lane change-over circuits. Lane selection in each intake is similar, therefore only selection for No.1 intake is described.

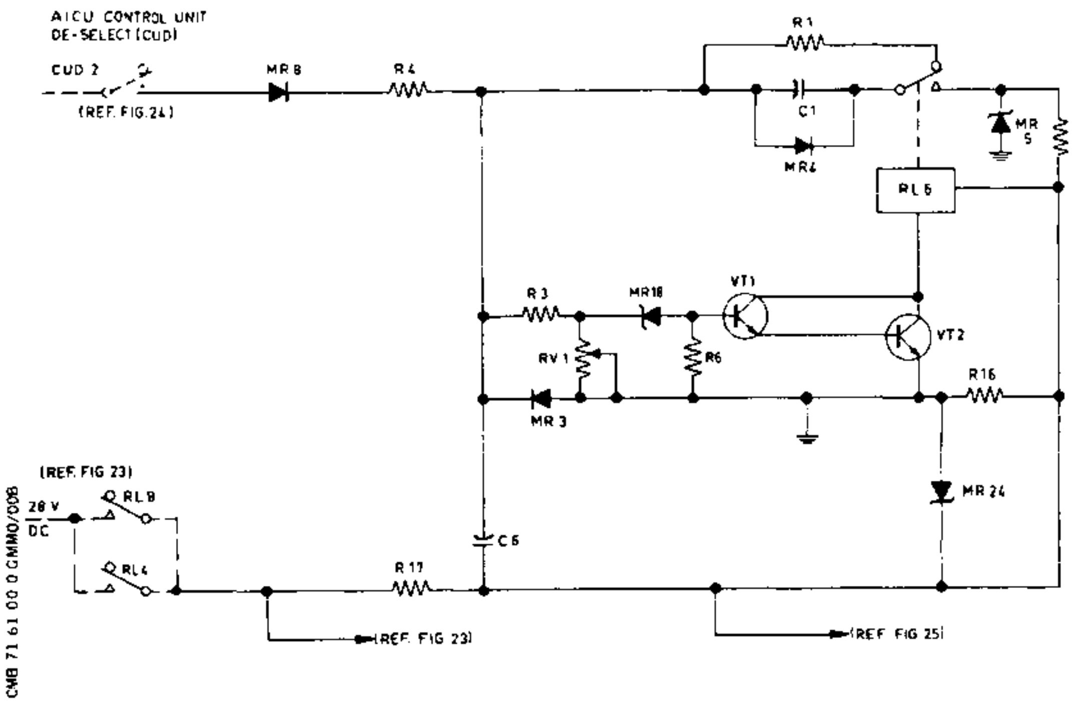
(a) Lane Starting and Hold Facility (Ref. Fig. 021)

A lane starting and hold facility in each control lane effects control of a lane start relay (RL6) as follows:-

When a 28 V d.c. supply is applied to the circuit by contacts of relay RL8 (main hydraulics selected), a supply is applied to the coil of relay RL6 and, through capacitor C6, to zener diode MR18. Zener diode MR18 then conducts and, in turn, switches transistors VT1 and VT2 'on' and completes the earth return circuit of relay RL6 which is then energized.

Energization of relay RL6 effects control in the associated control lane (Ref. Fig. 023) and applies a 20 V d.c. 'hold-on' supply, provided by zener diode MR5, via capacitor C1 to the base of VT1. VT1 and VT2 are then maintained conducting until capacitors C1 and C6 are charged.

Approximately 135 ms after the application of the starting supply, capacitors C1 and C6 are charged to a voltage sufficient to turn MR18, VT1 and VT2 'off', thus causing relay RL6 to



Typical Lane Start Circuit -
Simplified Schematic
Figure 021

be de-energized. Relay RL6 then remains de-energized until the start cycle is re-selected or a 'hold' condition is applied.

Application of a supply by contacts of relay (RL4) (standby hydraulics selected) initiates a similar control of the circuit.

When the lane is 'in use', application of a supply via contacts of the hold (H) and control unit deselect (CUD) relays in the associated AICU causes MR18 to conduct, and relay RL6 is energized. A maximum time limit of 0.5 s, on the length of time that the hold facility can be maintained, is effected by an associated control unit deselect delay relay in the AICU. When the hold facility is applied, relay H initiates energization of the control unit deselect delay relay which has a delay on energization of 0.5 s. After this delay the control unit deselect delay relay is energized and its

contacts energize the CUD relay. Contacts of the CUD relay interrupt the lane in-use hold-on circuit and terminate the hold facility. When the hold signal is removed the start cycle is reinstated (capacitor C6 allowed to charge), relay RL6 remains energized for a further 135 ms and is then de-energized.

This hold facility is imposed on relay RL6, to prevent spurious warnings from being given, for approximately 250 ms after a failed state of the AICU processor, Mach, Alpha, or N1 failure monitors.

(b) 'Lane Good' and 'N1 Good' Relays

Selection of a control lane is also dependent on the state of the AICU in that lane, and a 'lane good' relay L within the AICU must be energized before a lane can be accepted.

An additional relay N within the AICU, designated 'N1 good', effects control of selection of the lane in the auto-change mode and must be energized (N1 signal good) before an auto-change mode can be engaged.

(c) Subsonic Monitor Relay

Control of the lane is also effected by a subsonic monitor (SM) which operates a SM relay in the AICU; contacts of this relay are interposed in the lane selection and hold-on circuit.

Normally de-energized, the SM relay is energized if the ramps and/or spill doors are lowered at speeds below 0.60 M. When energized the relay initiates de-selection of the lane to enable the ramp and/or spill door to be restored to the fully-up position.

(d) Mode Select Relay

A mode select relay (RL3) effects control of the automatic lane change-over facility. Normally de-energized, in the auto-change mode, contacts of the relay introduce the AICU 'N1 good' relay contacts into the lane select and hold-on circuit. When energized (lane directly selected - auto change mode

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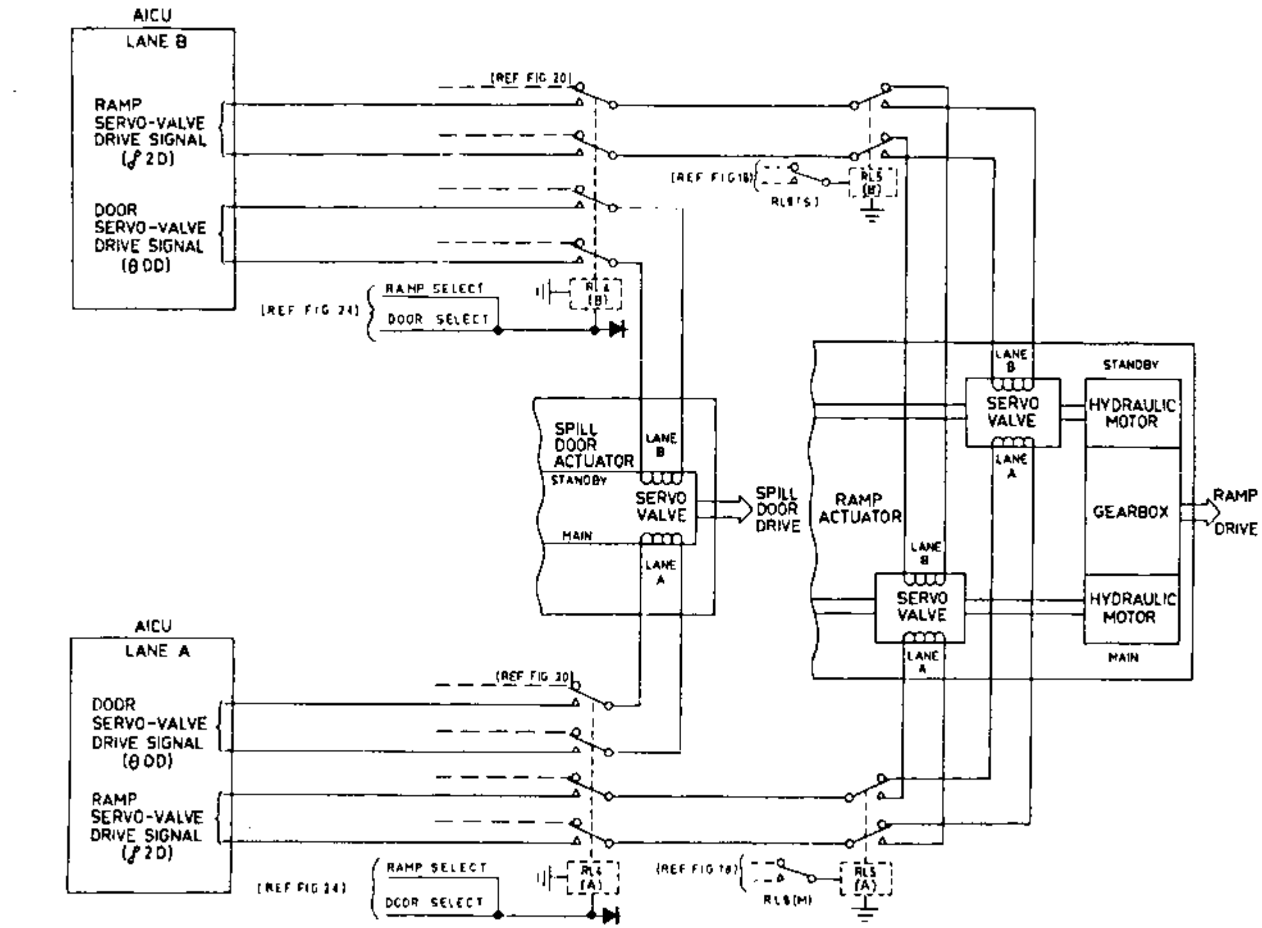

- Ramp and Spill Door Actuators Servo-valve Drive -
Simplified Schematic
R Figure 022

EFFECTIVITY: ALL

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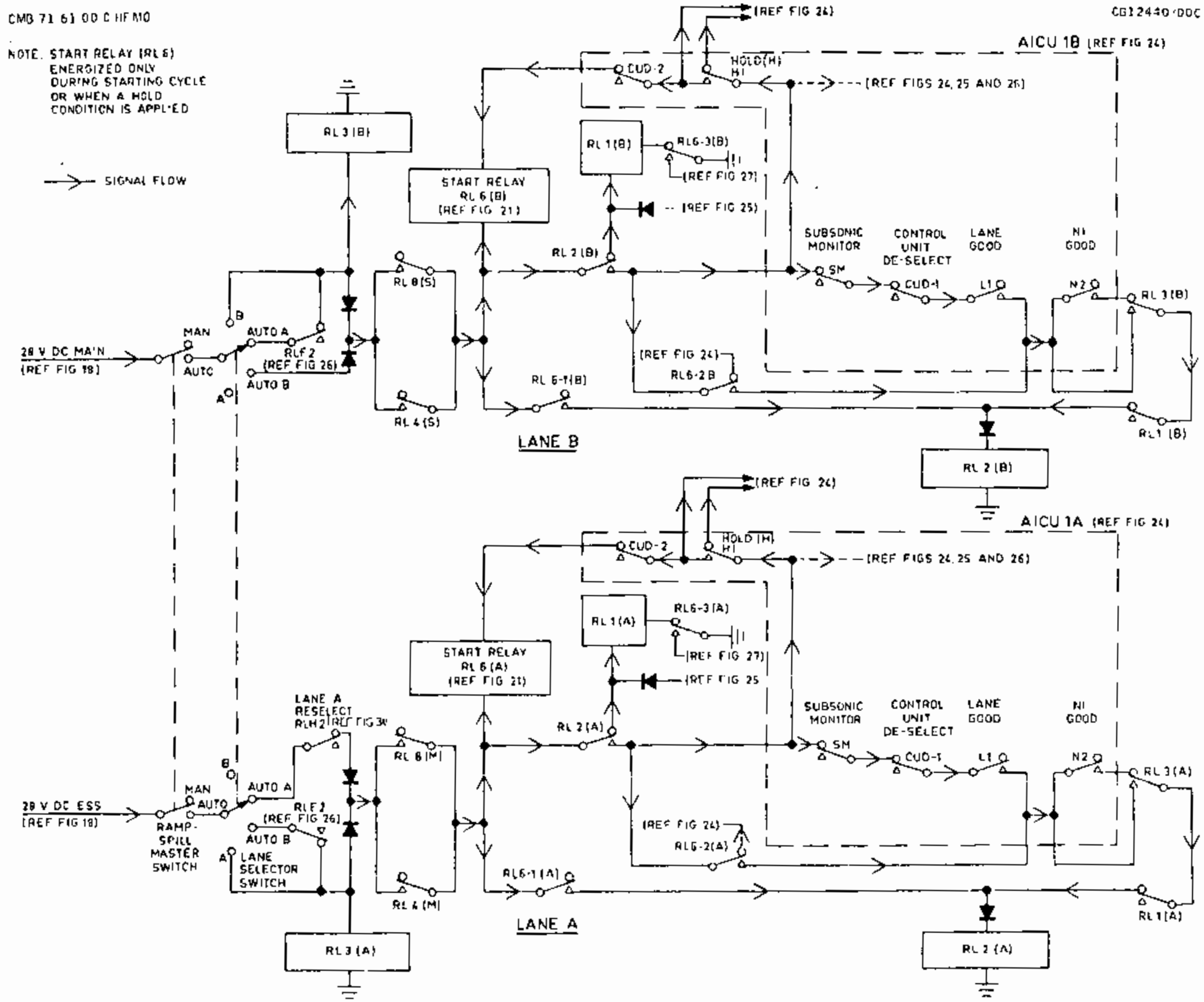

- Lane Selection and Automatic Change-over -
Simplified Schematic
Figure 023

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EFFECTIVITY: ALL

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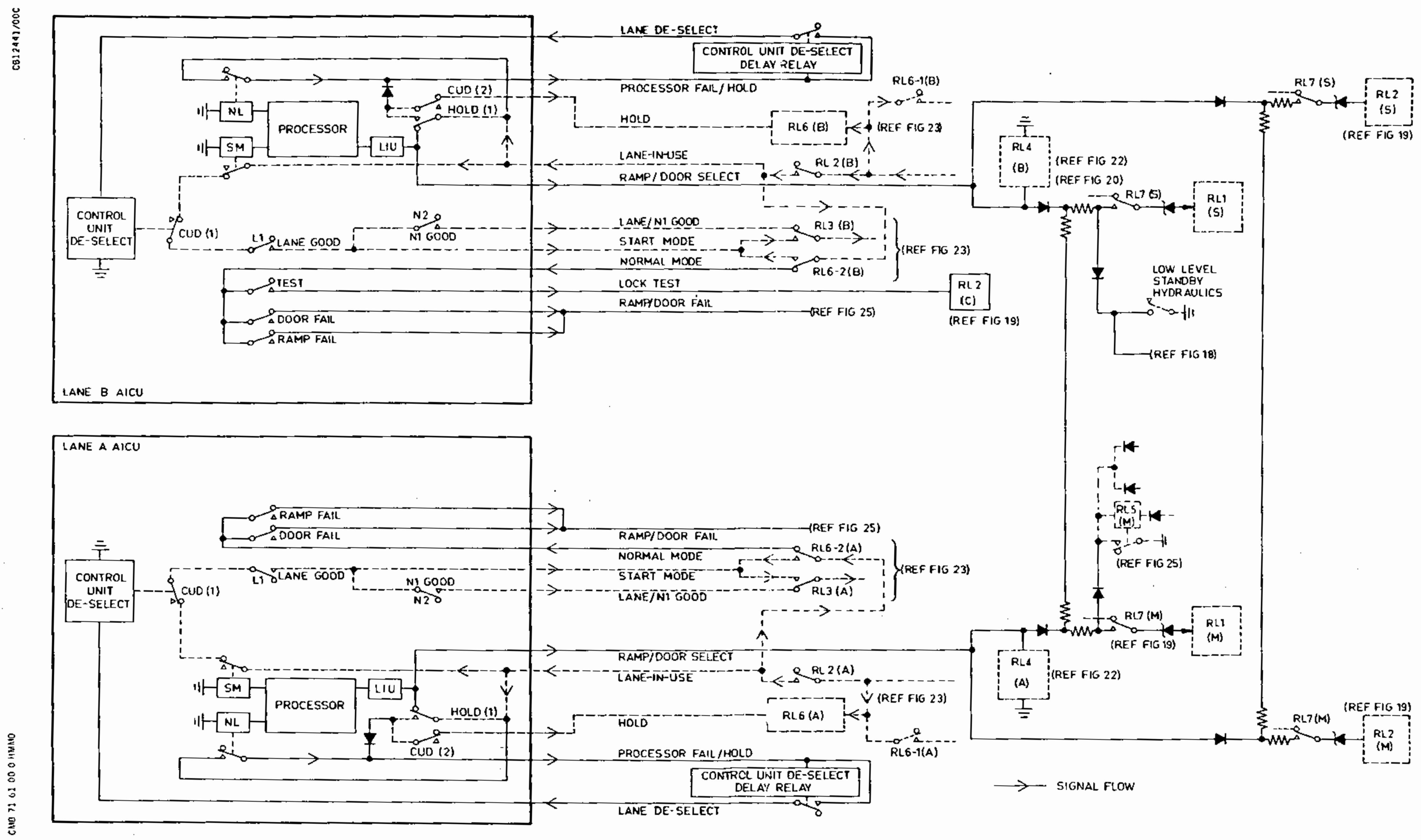

AICU Lane and Hydraulics Control -
Simplified Schematic
Figure 024

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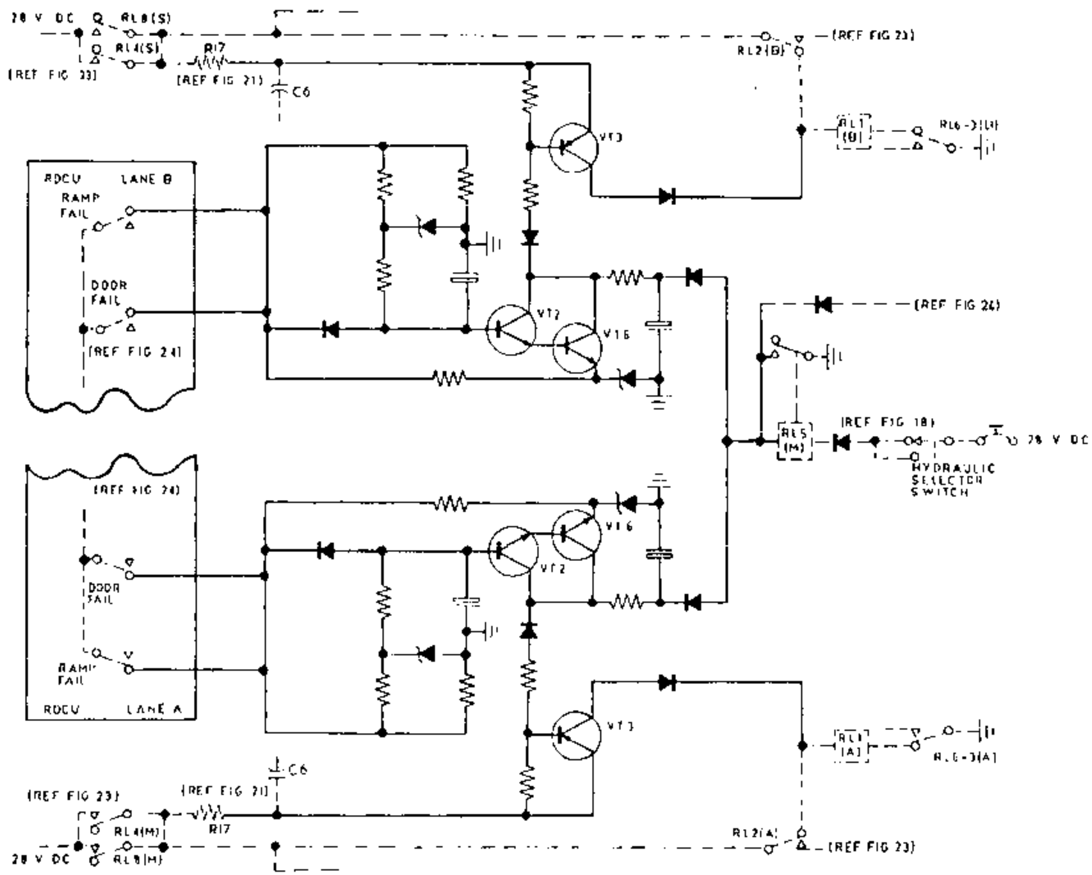
LANE B



LANE A

\- Ramp and/or Spill Door Failure Control -
Simplified Schematic
Figure 025

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EFFECTIVITY: ALL

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inhibited), contacts of the relay by-pass the 'N1 good' relay contacts, thus allowing the lane to be selected and/or maintained irrespective of the state of the N1 signal.

(e) Lane Select Relay

A lane select relay (RL2) maintains the lane hold-on circuit when a successful lane selection has been made and the lane-in-use is 'good'.

Normally energized at the start of the lane start cycle, the relay remains energized until the hold-on circuit is interrupted; a 40 ms delay on de-energization prevents transient faults from de-energizing the relay. If the hold-on circuit is interrupted in excess of 40 ms the relay is de-energized and its contacts interrupt the hold-on circuit and energize an associated lane disengage relay RL1 to ensure that the lane remains disengaged until re-selected.

(f) Lane Disengage Relay

Normally de-energized, lane disengage relay (RL1) is energized whenever relay RL2 is de-energized or a ramp/spill failure signal is present in an AICU in excess of 160 ms, (Ref. para.(3)(a)). When energized, contacts of the relay interrupt the lane hold-on circuit to initiate a lane change-over and maintain the failed lane disengaged. The relay is de-latched by contacts of relay RL6 and de-energized when the start cycle is subsequently selected.

(g) Lane 'A' Selection - LANE Selector Switch at Position A

When power supplies are made available on the aircraft a supply is applied to the LANE selector switch, via the RAMP - SPILL MASTER switch AUTO position. With the selector switch set to position A, lane A is selected as follows:-

g1) Relay RL3(A) is energized and contacts of the relay by-pass contacts N2 of the relay N in the lane A AICU, thus allowing lane A to be selected irrespective of

the state of the N1 signal.

g2) Relay RL6(A) is energized as previously described in para.(a), via contacts of relay RL8(M) (main hydraulics in use) or relay RL4(M) (standby hydraulics in use) and a supply is applied via contacts RL6-1(A) to energize relay RL2(A). Contacts RL6-2(A) inhibit the failure conditions associated with the AICU ramp fail and door fail relays, complete part of the lane selection circuit and override the control of the SM, CUD-1 and L1 relay contacts to allow time for the AICU circuitry to settle. Contacts RL6-3(A) unlatch and inhibit operation of relay RL1(A) and prevent illumination of the LANE fail, Alpha fail and N1 SIG fail captions (Ref. Fig. 027).

g3) When energized, relay RL2(A) completes a start circuit via contacts RL6-2A, RL3(A) and RL1(A) and part of a parallel hold-on supply circuit via relay contacts SM, CUD-1, L1, N2, RL3(A) and RL1(A) to maintain relay RL2(A) energized and the lane in use. The 'lane in use' supply is also applied via contacts of the AICU 'hold' relay to arm the hold facility associated with relay RL6(A) and to energize a 'lane in use' relay which, in turn, energizes the AICU processor. The processor commences to read after a delay of 40 ms, (Ref. Fig. 024). In addition, a supply is applied to illuminate the lane A 'lane in use' lamp (Ref. Fig. 026) and energize lane failure relays RLE2 and RLF2 in the auto control panel. Relay RL2(A) has a delay on de-energizing to maintain the hold-on circuit to relay RL2(A) for approximately 40 ms after the start relay RL6(A) is de-energized. This delay allows time for system switching within the AICU to be effected and the hold-on supply circuit to be sustained.

g4) Approximately 135 ms after selection of the lane, relay RL6(A) is de-energized, all failure warning circuits are armed and, provided that the hold-on supply circuit is completed before the 40 ms

delay on the de-energization of relay RL2 has expired, relay RL2(A) remains energized, and the A 'lane in use' lamp (Ref. Fig. 026) remains illuminated.

g5) In addition, the 'lane in use' supply is also applied, via contacts of the AICU 'hold' relay, to provide a common ramp and door select signal. This signal then energizes relay RL4(A) and either relays RL1(M) and RL2(M) (main hydraulics selected - relay RL7(M) energized) or relays RL1(S) and RL2(S) (standby hydraulics selected - relay RL7(S) energized). Energization of relay RL4(A) applies the spill door servo-valve drive signals to the lane A spill door actuator servo-valve, and the ramp servo-valve drive signals to relay contacts RL5(A). Relay RL5(A), if energized (main hydraulics selected), applies the signal to the main hydraulic servo-valve in the ramp actuator, or, if de-energized (standby hydraulics selected), to the standby servo-valve in the ramp actuator.

g6) When energized, relays RL1(M) and RL2(M) (main hydraulics in use) energize the ramp actuator main hydraulics selector valve and the spill door actuator main hydraulics selector and unlock valves (Ref. Fig. 019). In this condition, the valves are opened and the main hydraulic supplies are applied to the ramp and spill door servo-valves. Subsequent control signals, applied by the controlling lane to the servo-valves, operate the ramp main hydraulic motor and the spill door actuator, and the ramp and spill door are moved to the demanded position.

g7) When relays RL1(S) and RL2(S) are energized (standby hydraulics in-use), control of the ramp and spill door is effected in a similar manner to that described in paragraph g6) as applied to the standby hydraulic system components. Additional relay contacts RL2(C) are included in the supply line to the standby

hydraulics spill door selector valve; these contacts form part of the spill door lock test facility (Ref. Fig. 019).

When the hold facility is imposed -

g1) the AICU 'lane in use' relay is de-energized.

g2) the AICU processor is de-selected,

g3) the ramp/door select signal is removed,

g4) the ramp and spill door are 'frozen',

g5) the associated failure warnings are inhibited, and

g6) energization of the control unit de-select delay relay is initiated.

A 0.5 s delay on energizing, imposed on the control unit de-select delay relay, ensures that the hold facility can only be maintained during this delay period. If this delay time is exceeded, the control unit deselect delay relay is energized, contacts of this relay energize a control unit de-select relay which, in turn, interrupts the supply to the hold circuit of start relay RL6(A); capacitor C6 is allowed to charge and the starting function then continues for approximately 135 ms; at the end of this period relay RL6(A) is de-energized, and, after a delay of approximately 40 ms, relay RL2(A) is de-energized. Contacts of this relay interrupt the 'lane in use' supply, extinguish the 'lane in use' lamp and connect the supply to energize 'lane disengage' relay RL1(A) which, in turn, maintains the lane disengaged, illuminates the LANE failure caption and initiates illumination of the amber INT master warning caption. Relay RL1(A) remains energized until the lane is reselected.

If a ramp/door failure signal occurs (Ref. Fig. 025) transistors VT2 and VT6 are energized and a 10 ms delay in the operation of transistor VT3 commences and the hydraulic systems are changed over (Ref. para.(3)(a)). If the change-over

removes the failure signal transistors VT2 and VT6 cease conducting and inhibit the operation of transistor VT3 and the lane is retained in use. If the failure condition remains transistor VT3 conducts and relay RL1(A) is energized; the lane is then disengaged by relay RL1(A) as follows:-

g1) Contacts of the relay interrupt the lane hold-on supply to relay RL2(A) and initiate illumination of the LANE failure caption.

g2) Removal of the lane hold-on supply allows RL2(A) to commence a 40 ms delay on de-energizing. After the 40 ms delay on relay RL2(A) has expired, the relay is de-energized and its contacts disengage the lane, extinguish the 'lane in use lamp' and latch relay RL1(A) energized, thus ensuring that the lane remains disengaged until the lane is reselected.

(h) Lane B Selection - Lane Selector Switch at Position B

With the lane selector switch at position B, control lane B is selected in a similar manner to that described for the selection of lane A in paragraph (g), as applied to lane B and lane B system components.

(i) Lane A Selection - Lane Selector Switch at Position AUTO A

With the lane selector switch at position AUTO A, control lane A is selected in a similar manner to that described for the selection of lane A in paragraph (g), except that relay RL3(A) is not energized and an automatic change-over circuit is armed to allow lane B to be automatically selected if a failure of lane A occurs. In this condition, contacts RL3(A) introduce the AICU 'N1 good' relay contacts into the lane select and hold-on circuit, thus ensuring that the N1 signal is 'good' before the lane can be selected. Subsequent failure of the N1 signal results in the lane being de-selected.

The automatic lane change facility is armed

by contacts of lane failure relays RLE2 and RLF2. Relays RLE2 and RLF2 are energized when lane A is 'in-use', via normally-open contacts of relay RL2(A) and the lane selector switch in the AUTO A position. When energized, contacts of the relays effect control as follows:-

i1) RLE2-1 - not used in the lane A start mode.

RLE2-2 - connect a supply to maintain intake failure relay RLD2 de-energized.

RLF2-1 - arm the lane B auto start circuit.

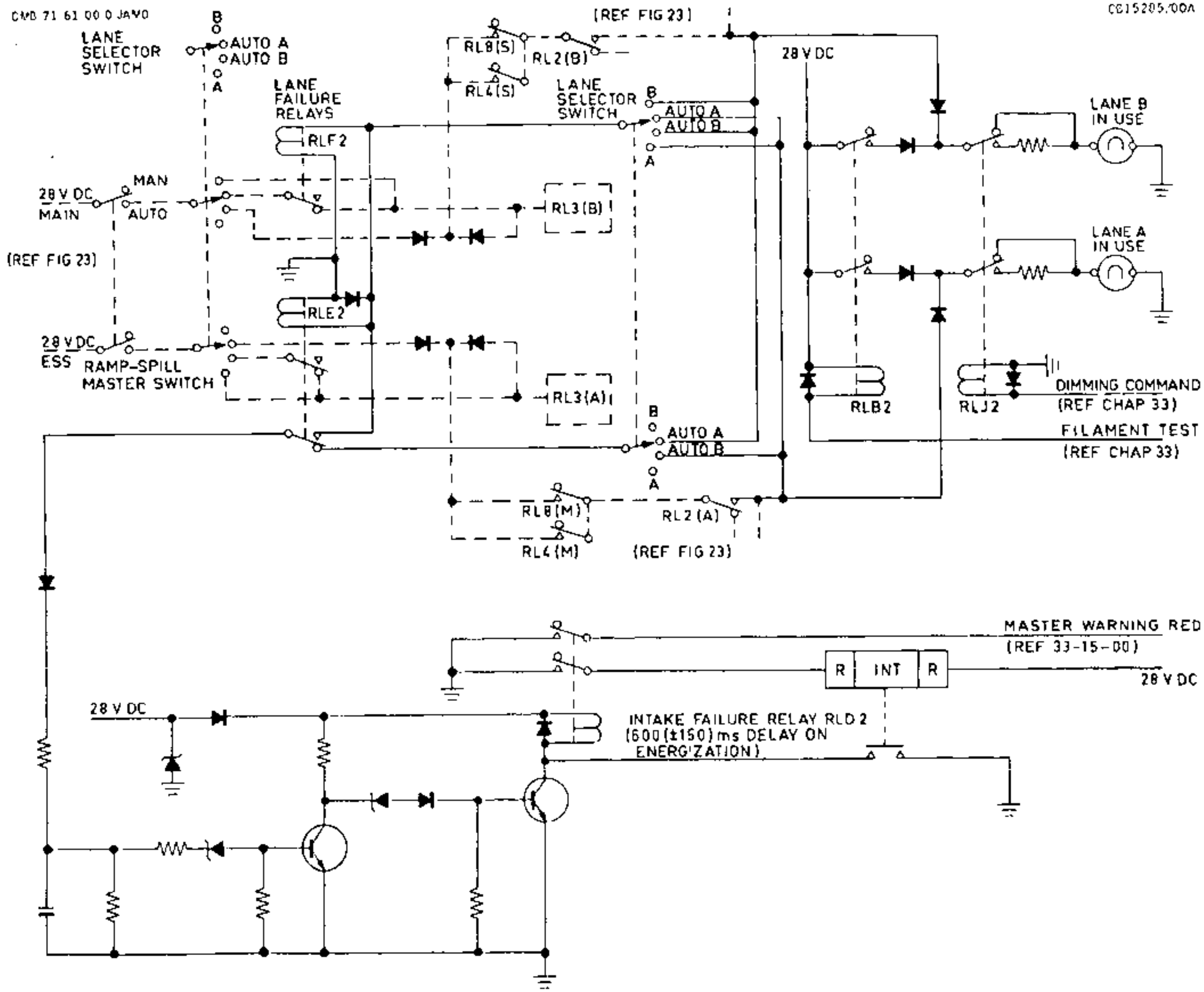
Subsequent failures in lane A (relay RL2(A) de-energized) de-select lane A and result in relays RLE2 and RLF2 becoming de-energized, LANE A failure caption being illuminated accompanied by an amber master warning, the lane A 'lane in use' lamp being extinguished and the de-energizing supply being removed from relay RLD2 which has a delay on energizing of 600(±150) ms.

De-energization of relay RLF2 -

i1) energizes relay RL3(B) and contacts of this relay bypass the 'N1 good' contacts in the lane B start circuit to enable the lane to be selected with an N1 signal failure present, and

i2) completes the start circuit of control lane B which, provided hydraulic supplies are available, is then selected and control of the intake is continued by lane B.

When 'in use', the lane B 'lane in use' supply illuminates the lane B 'lane in use' lamp, and maintains relay RLD2 de-energized via de-energized relay RLE2. As this supply is applied before the delay on energization of relay RLD2 has expired, operation of the red INT failure caption is inhibited. Subsequent failure of control lane B results in the lane being disengaged, the extinguishing of the lane B 'lane in use' lamp, the illumination of the LANE B failure warning



- Lane in Use and Intake Failure Indication -
Simplified Schematic
Figure 026

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accompanied by an amber master warning, and the removal of the de-energizing supply from relay RLD2; after expiration of the delay period relay RLD2 is energized and the INT failure warning caption is illuminated, accompanied by a red master warning.

(j) Lane B Selection - Lane Selector Switch at Position AUTO B

With the lane selector switch at position AUTO B, control lane B is selected in a similar manner to that described for the selection of lane B in paragraph (h), except that relay RL3(B) is not energized and an automatic change-over circuit is armed, by relay RLE2 to allow lane A to be automatically selected if a failure of lane B occurs.

Subsequent operations are carried out in a similar manner to that described for LANE A selection in paragraph (i) as applied to control lane B.

(6) LANE, Alpha, and N1 SIG Failure Indication (Ref. Fig. 027)

Control of each LANE failure caption is effected by the associated AICU, whether the lane is selected or not.

A normally energized 'lane good' relay in each AICU is de-energized on receipt of a 'lane fail' signal from the AICU failure monitor logic circuit. De-energization of an AICU 'lane fail' relay energizes an associated 'lane fail' relay RLC1 (lane A) or RLD1 (lane B) on the ACP which, in turn, connects a supply to illuminate the appropriate LANE failure caption and to initiate an amber master warning (Ref. 33-15-00). The caption will remain illuminated until the fault is rectified. A dimming facility, controlled by a dimming relay (RLB1) in the ACP, enables the LANE captions to be dimmed by inserting a resistance in series with each lamp when a dimming command signal is applied to relay RLB1 (Ref. 33-14-00).

Additional control of the LANE failure captions is effected by 'lane disengage' relays RL1(A) and RL1(B). These relays are energized when the lane is disengaged and, in turn, energize the appropriate

'lane fail' relay RLC1 or RLD1 on the ACP to illuminate the associated lane failure caption. The caption will remain illuminated until the lane is re-selected. Relay RL1(A) is unlatched and inhibited by relay contacts RL6-3(A) during the starting cycle of lane A. Similar control of relay RL1(B) is effected during the starting cycle of lane B, by relay contacts RL6-3(B).

Control of the Alpha fail caption, which is common to all four intakes, is effected by either a lane A or a lane B AICU in each intake as determined by the position of the lane selector switch. A normally energized 'Alpha good' relay in each AICU is de-energized on receipt of a failure signal from the AICU failure monitor logic circuit. De-energization of the relay initiates energization of an Alpha fail relay (RLG2) in the ACP. Energization of relay RLG2 applies a supply to illuminate the 'Alpha' fail caption and to initiate a master warning amber INT failure warning. The warning caption will remain illuminated until the fault is rectified or the alternative lane is selected.

Control of the N1 SIG failure caption is effected by either a lane A or a lane B AICU, as determined by the position of the lane selector switch. A normally energized 'N1 good' relay in each AICU is de-energized on receipt of a failure signal from the AICU failure monitor logic circuit. De-energization of the relay initiates energization of a N1 SIG fail relay (RLE1) in the ACP, and relay RLE1 is energized and latched after a delay of 10(±2) ms; this delay prevents the relay from being latched by spurious failure signals. When energized, contacts of relay RLE1 complete a latching circuit to maintain the relay in the energized condition and connect a supply to illuminate the N1 SIG failure caption and initiate a master warning amber INT failure warning. An unlatch circuit, to permit the resetting of relay RLE1, is activated by selecting the alternative lane or, during the pre-flight check procedure, by contacts of a pre-flight check unlatch relay (RLH2) which is automatically operated by the pre-flight check test unit (Ref. Fig. 031).

During the lane starting cycle operation of the failure captions is prevented by lane start relay contacts RL6-3(A) or RL6-3(B). These contacts

apply an inhibit signal to the lane, alpha and N1 SIG failure relays in the ACP for approximately 135 ms to prevent transient failures from being indicated during the start cycle.

In addition, illumination of the LANE, 'Alpha' and N1 SIG captions is inhibited in the manual operating modes by an inhibit signal applied by the RAMP - SPILL MASTER switches to the lane, alpha and N1 SIG failure relays in the ACP when the switches are in the MAN position.

R (7) Equipment Failure Identification (Ref. Fig. 031)

When power is applied to the aircraft, that part of the AITU which interrogates system components is activated. Subsequent component failures are detected and indicated on the AITP as follows:-

(a) Equipment failures are sensed by the AICUs which, in turn, transmit a failure signal, via the test highway, to the AITU.

(b) The failure signal is then processed in the AITU to deduce which item of equipment has failed. The resulting failure signal is applied to illuminate the appropriate failure caption on the AITP (Ref. Fig. 012). This caption then remains illuminated until remedial action has been taken.

(8) Engine Control Signals

Engine control signals (ECS) provided by the AICS effect control in the associated engine control system as follows:-

R (a) Auto N1 Reduce Signal
R (Ref. Fig. 028)

The auto N1 reduce signal is provided by scheduling N1/square root of theta against local mach number within each
R AICU. This signal schedules engine air
R mass flow to preserve surge margin at
R high mach numbers and is applied to the
R ECS either -

a1) via contacts of relay RL5(C) (lane A controlling - relay RL2(A) energized, relay RL2(B) de-

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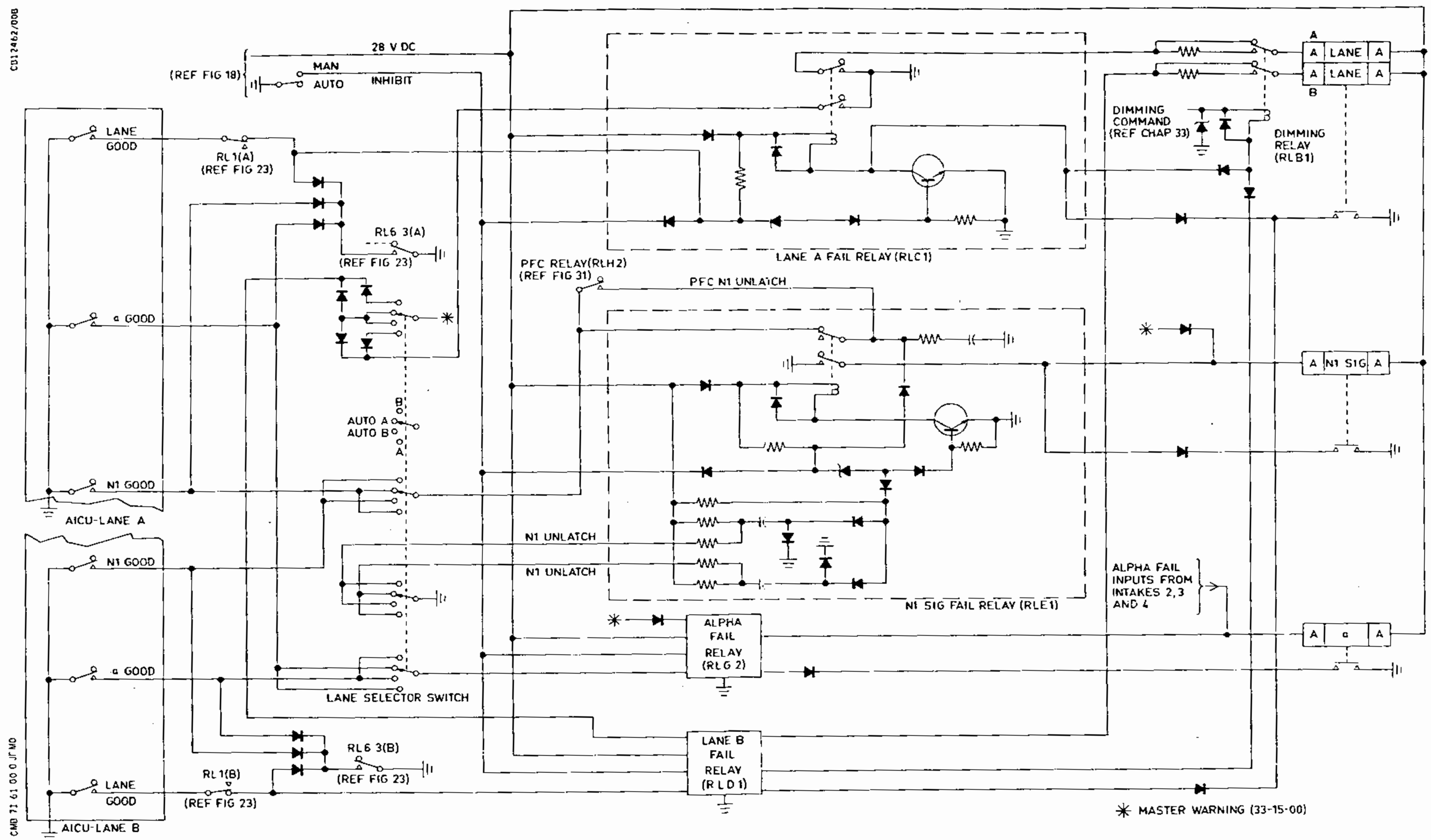

Lane and Warning Indications -
Simplified Schematic
Figure 027

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energized), or

a2) via contacts of relay RL5(C) (lane B controlling - relay RL2(A) de-energized, relay RL2(B) energized).

R (b) Auto N1 Reduce Signal Failure Indication
R (Ref. Fig. 029)

Failure of the auto N1 reduce signal in a selected AICU, results in energization of an auto N1 reduce fail relay within the AICU. Contacts of the relay complete an earth return circuit to illuminate an auto N1 reduce failure lamp on the bezel of No.1 engine N1 indicator (Ref. 71-11-00) and apply a warning signal to the master warning system (amber) and a failure signal to the AITU either -

R (b1) via normally-closed contacts of relay RL4(C) (lane A controlling - relay RL2(B) de-energized), or

R (b2) via normally-open contacts of relay RL4(C) (lane B controlling - relay RL2(B) energized).

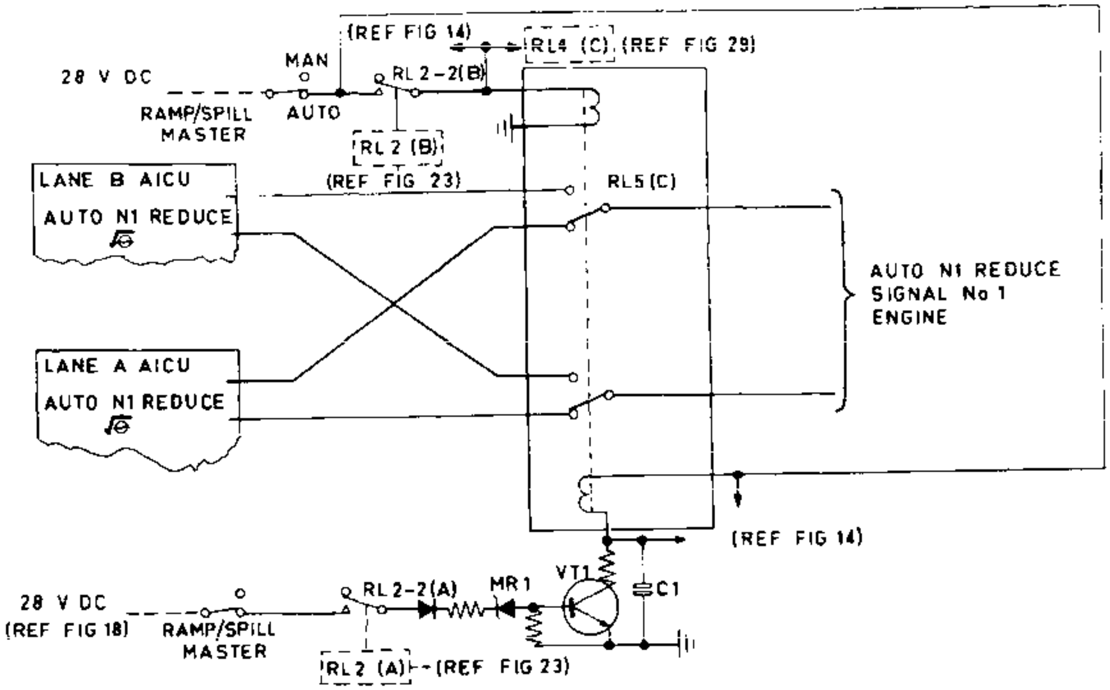
R (c) Engine Handling (Ref. Fig. 030)

The engine handling signal is provided, via a transformer-coupling, by a total pressure (PT) signal within each AICU. The signal is continuous and is applied by the controlling AICU either -

R (c1) via normally-closed contacts of relay RL4(C) (lane A selected - relay RL4(C) de-energized), or

R (c2) via normally-open contacts of relay RL4(C) (lane B selected - relay RL4(C) energized; relay RL4(C) is energized via contacts of relay RL2(B) whenever lane B is selected).

(9) Pressure Ratio Error Indication (Ref. Fig.013 and 014)



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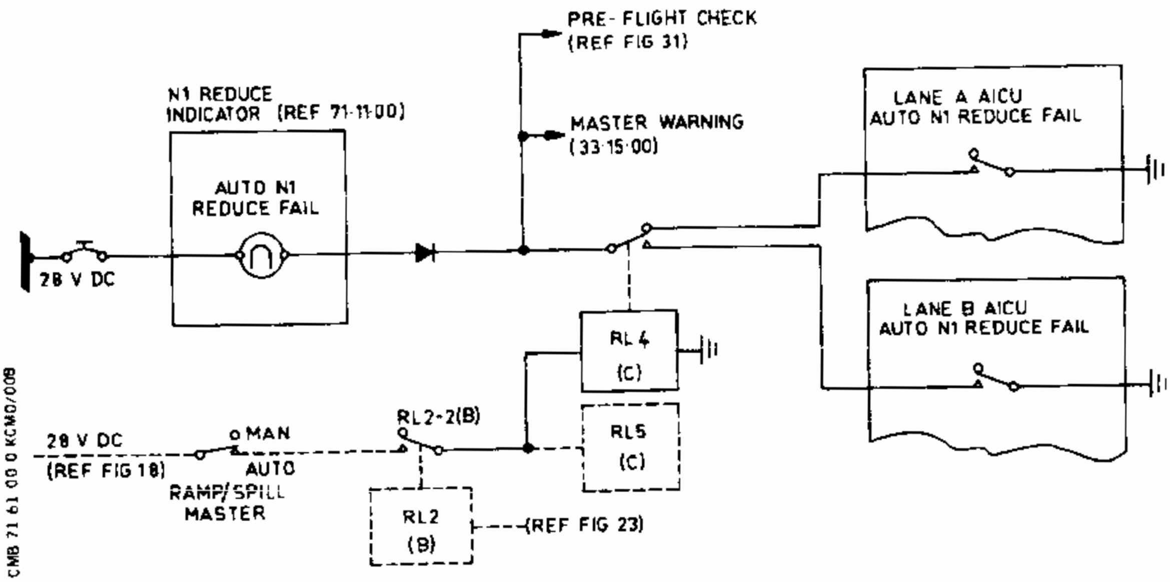
- No.1 Intake ECS Auto N1 Reduce Control -
Simplified Schematic
Figure 028

A pressure ratio error indication signal is provided within the AICU in each lane and applied from the controlling AICU to the pressure ratio error indicator via contacts of a pressure ratio error relay RL1(C).

Normally, with lane A controlling, relay RL1(C) is energized, via the RAMP - SPILL MASTER switch at AUTO and contacts of energized lane select relay RL2(A) (Ref. Fig. 023), to connect the pressure ratio error indicator to the lane A error signal output.

Failure of lane A results in relay RL2(A) becoming de-energized and lane B being selected. Relay RL1(C) is then energized in the opposite direction, via the RAMP - SPILL MASTER switch at AUTO and contacts of energized lane select relay RL2(B) (Ref. Fig. 023), to connect the pressure ratio error indicator to the lane B error signal output.

R (10) Pre-flight Check (Ref. Fig.012 and 031)



- No.1 Intake ECS Auto N1 Reduce Indication -
Simplified Schematic
Figure 029

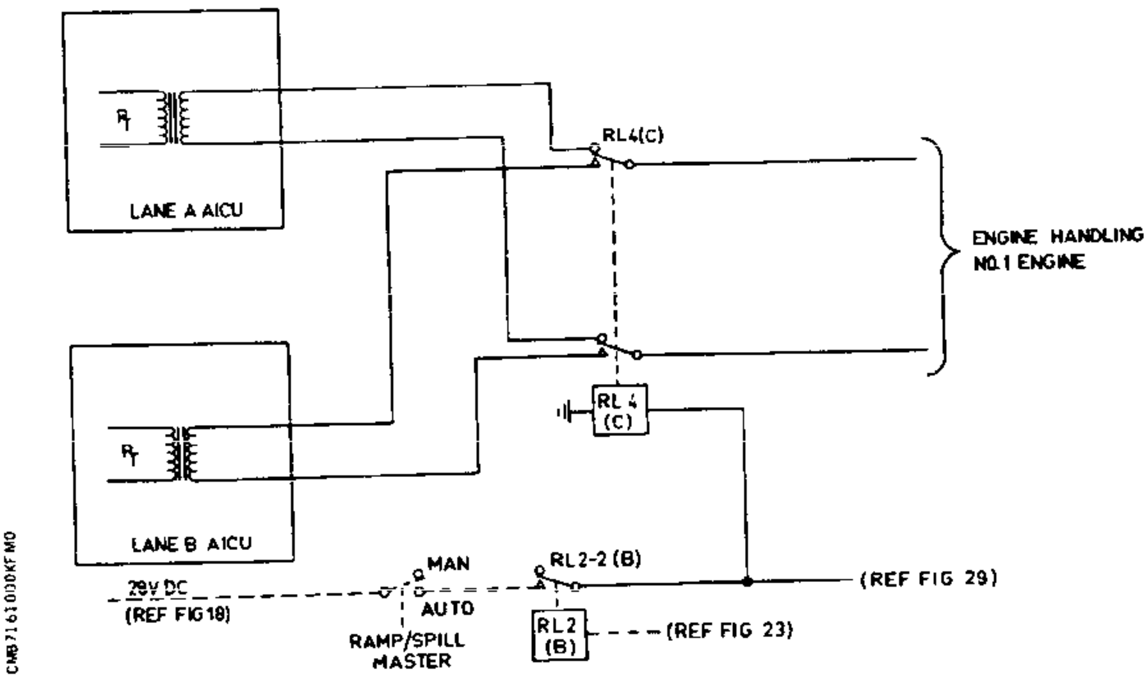
R The pre-flight check is initiated by controls located on the AITP in conjunction with the AICS control switches and combinations of the hydraulic systems.

R In addition, four AICS GROUND - FLIGHT switches located on the RAM AIR TURBINE test panel (Ref. Fig. 032), effect control in the pre-flight check selection procedure as follows:-

(a) In the FLIGHT position, selection of the pre-flight check is inhibited by open-circuiting the test select line to the AISUs and the AICUs.

(b) In the GROUND position the inhibition is removed.

The intake checking sequence, which checks either



- No.1 Intake ECS Engine Handling Control -
Simplified Schematic
Figure 030

intakes 1 and 2 followed by intakes 3 and 4 or all four intakes simultaneously, is controlled by pressure signals from the blue, green and yellow hydraulic systems as follows:-

(a) Intakes 1 and 2 - green and yellow systems pressurized.

(b) Intakes 3 and 4 - blue and yellow systems pressurized.

(c) Intakes 1, 2, 3 and 4 - green, blue and yellow systems pressurized.

R Setting the four AICS GROUND-FLIGHT switches to
R GROUND completes the test select lines to the AISUs
R and AICUs. When any one switch is set to GROUND,
R all four INT red master warnings are initiated, with
R gong. Subsequent setting of any remaining switch or
R switches to GROUND has no further effect. The ON-OFF
R switch on the AITP, when set to the ON position,

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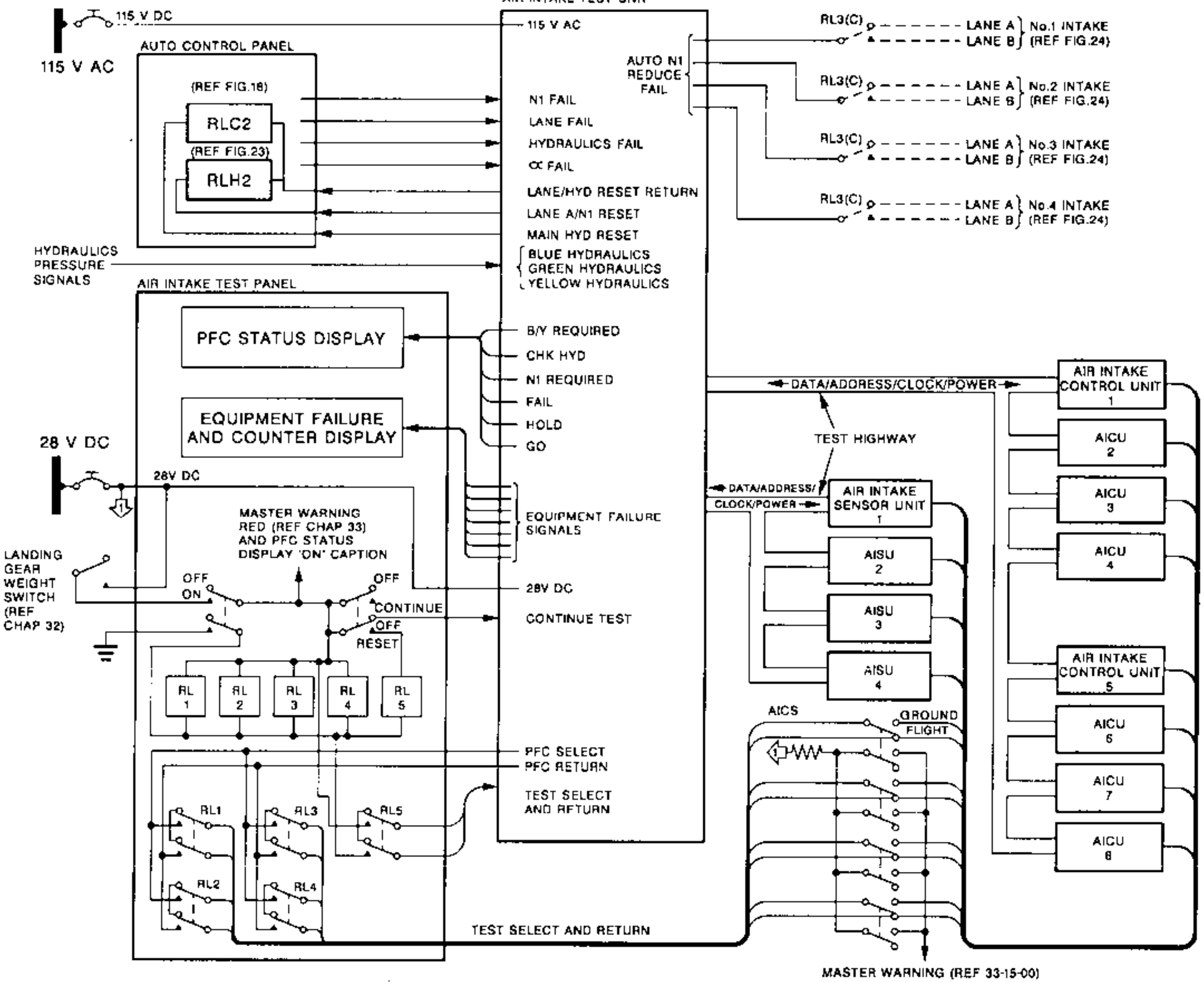

Pre-flight Check (PFC) Control
Figure 031

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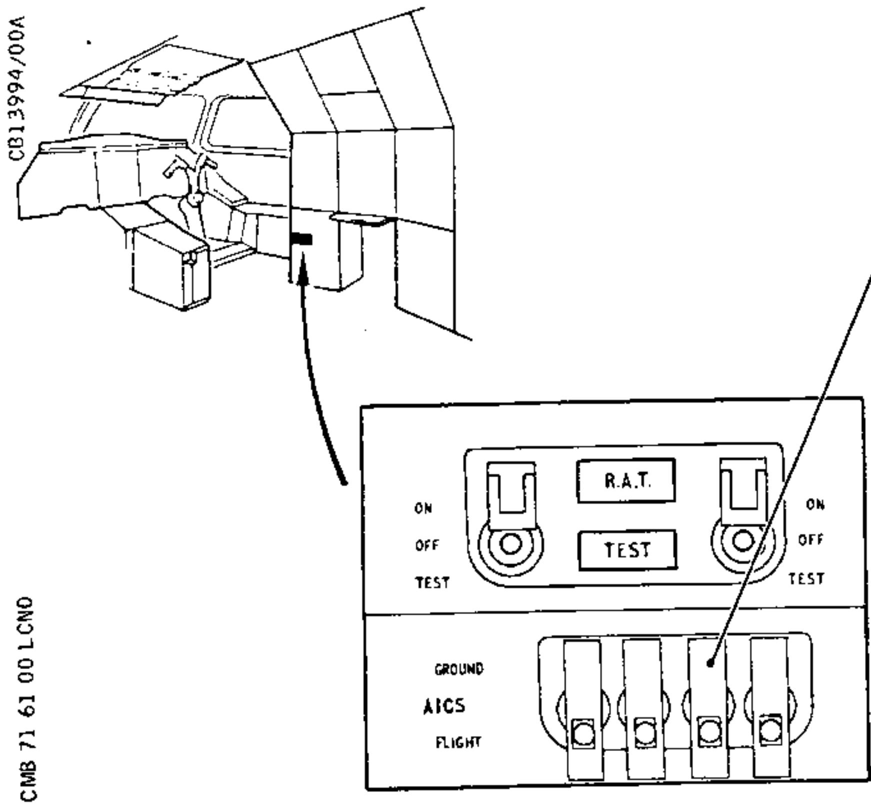


\- AICS Ground-flight Switches - Location
Figure 032

R arms the pre-flight check (by energizing the relays
R RL1,2,3, 4 and 5 in the AITP, thus selecting the PFC
R facility at each of the AISUs and applying a test
R select signal to the AITU), and illuminates the system
R ON caption.

R The program is then started by setting the CONTINUE-
R OFF switch to CONTINUE.

The checks are based on simulating in-flight modes of operation which include exercising the control surfaces and simulating individual unit failures to ensure that no dormant failure exists which could prevent the correct action from being taken. This is achieved by using 'dummy' aerodynamic input data, namely, pitot-static pressures, incidence and failure signals which are injected into the AICUs. The dummy data are generated within the AITU and are transmitted to the AICUs via the AISUs along the test highway. The program is arranged so that the AITU transmits the dummy data to the four AISUs and then compares the

resulting system status signals with a known status. The system consists of a simple sequence counter clocking a data and pattern sequencer which, in turn, addresses a data and a pattern store.

After a set of data has been transmitted to the AISUs a particular system status is selected from the pattern store and entered into a comparator for comparison with the incoming system information. Once a pattern has been entered into a comparator a signal is applied to a 'fail latch' so that the comparator must indicate a 'good state' in order to reset the latch, otherwise a 'failure state' is registered. During a comparison the sequence counter is prevented from advancing until the comparator indicates a good state. If the comparison is successful the sequence counter is advanced but, if unsuccessful, the sequence is held and a signal designated 'hold' is applied to the HOLD caption on the AITP. In addition, a binary pattern store address signal is applied to the binary pattern captions on the AITP and the relevant captions are illuminated to indicate which particular test has failed. Another signal is also generated and applied to the AITP to illuminate the caption associated with the particular item of equipment which has failed.

After a failure the program is restarted by operating the CONTINUE switch on the AITP. This action extinguishes the HOLD, binary pattern sequence and equipment failure captions and advances the sequence counter. The test then continues but the signal in the fail latch is held to illuminate the FAIL caption on the AITP at the end of the program.

If the program is completed without a failure state being given a satisfactory signal is applied to the AITP to illuminate the GO caption.

The RESET switch on the AITP allows the program to be reset to the beginning of the test sequence any time that the facility is required. In addition, the RESET switch also enables the caption failure display to be cleared at any time.

Other signals provided during the pre-flight check are -

(a) lane and hydraulic reset signals - provided to

reset lane A (relay RLH2) and the main hydraulic system (relay RLC2) control circuits after a simulated failure has been sustained,

(b) CHK HYD - provided at the beginning of the program if the green, blue and yellow systems are not pressurized,

(c) B/Y REQD - provided at a certain point in the program after the checks have been completed on the intakes 1 and 2 if the blue and yellow systems are not pressurized, and

(d) N1 REQD - provided when the engines are not running, at a certain point in the program when it is required to check the N1 input.

NOTE: For conditions (b), (c) and (d) the program is held until the condition stated is fulfilled. The program is continued by operating the CONTINUE switch.

At the completion of the pre-flight check program the ramps and spill doors are at the 10 deg and 5 deg positions respectively. On removal of the test data the ramps and spill doors are returned to the take-off position (ramps fully up and spill doors closed) by the normal operating mode signals, thus enabling the disconnection of the pre-flight check signals and the restoration of the normal operating mode signals to be checked by observing the ramp and spill door indicators on the MCP.

(11) Equipment Failure Diagnosis

In flight the AITU receives data on the test highway from the AICUs and uses this information to determine the serviceability of the main components in the AICS.

The AITU receives an input signal from each of the eight AICUs and uses this information to produce an equipment failure signal whenever a comparator senses a fail state. These failures are validated by the AITU so that any signal must indicate a fail state for eight consecutive cycles before a failure signal is confirmed.

A confirmed failure signal is then applied to a latching relay in the AITU which, in turn, applies a failure signal to the appropriate equipment failure caption on the AITP. The caption is illuminated and remains illuminated for the duration of the flight but, if required, can be cancelled by the RESET switch on the AITP.

C. Power Supplies

(1) Electrical power is supplied from the busbars listed in Table 6.

SERVICE	BUSBAR
INTERFACE UNIT 1A/2B SUP	'A' essential 28 V d.c.
INTERFACE UNIT 2A/1B SUP	'A' main 28 V d.c.
INTERFACE UNIT 3A/4B SUP	'B' essential 28 V d.c.
INTERFACE UNIT 4A/3B SUP	'B' main 28 V d.c.
AICU 1A SUP	No.1 essential 115 V a.c.
AICU 2A SUP	No.3 main 115 V a.c.
AICU 3A SUP	No.2 essential 115 V a.c.
AICU 4A SUP	No.4 main 115 V a.c.
AICU 1B SUP	No.4 main 115 V a.c.
AICU 2B SUP	No.2 essential 115 V a.c.
AICU 3B SUP	No.3 main 115 V a.c.
AICU 4B SUP	No.1 essential 115 V a.c.
SENSOR UNIT 1 SUP	No.1 essential 115 V a.c.
SENSOR UNIT 2 SUP	No.3 main 115 V a.c.
SENSOR UNIT 3 SUP	No.2 essential 115 V a.c.
SENSOR UNIT 4 SUP	No.4 main 115 V a.c.

SERVICE	BUSBAR
INCIDENCE SENSOR 1 SUP	'B' essential 26 V a.c.
INCIDENCE SENSOR 2 SUP	'A' essential 26 V a.c.
INT 1 RAMP & SPILL POSN IND	'A' essential 26 V a.c.
INT 2 RAMP & SPILL POSN IND	'B' essential 26 V a.c.
INT 3 RAMP & SPILL POSN IND	'B' essential 26 V a.c.
INT 4 RAMP & SPILL POSN IND	'A' essential 26 V a.c.
INT 1 IND SUP	'B' essential 28 V d.c.
INT 2 IND SUP	'B' essential 28 V d.c.
INT 3 IND SUP	'A' essential 28 V d.c.
INT 4 IND SUP	'A' essential 28 V d.c.
TEST PNL SUP	'B' main 28 V d.c.
TEST UNIT SUP	No.3 main 115 V a.c.
INT 1 MAIN HYD SUP	'A' essential 28 V d.c.
INT 2 MAIN HYD SUP	'A' main 28 V d.c.
INT 3 MAIN HYD SUP	'B' essential 28 V d.c.
INT 4 MAIN HYD SUP	'B' main 28 V d.c.
INT 1 ST'BY HYD SUP	'B' main 28 V d.c.
INT 2 ST'BY HYD SUP	'A' essential 28 V d.c.
INT 3 ST'BY HYD SUP	'A' main 28 V d.c.

SERVICE	BUSBAR
INT 4 ST'BY HYD SUP	'B' essential 28 V d.c.

Electrical Power Supplies
Table 6

26. System Management (Ref. Fig. 033, 034 and 035)

Management of the AICS is described in relation to the controls and indicators on the intake auto control panel (ACP) manual control panel (MCP), and air intake test panel (AITP).

The ACP is divided into four identical columns, one for the control of each intake, with the exception of the Alpha failure caption which is common to all four intakes. System failures are indicated by illumination of the appropriate failure captions and the 'lane in use' is indicated by illumination of either an A or a B green indicator lamp.

The system failures are divided into three categories as follows:-

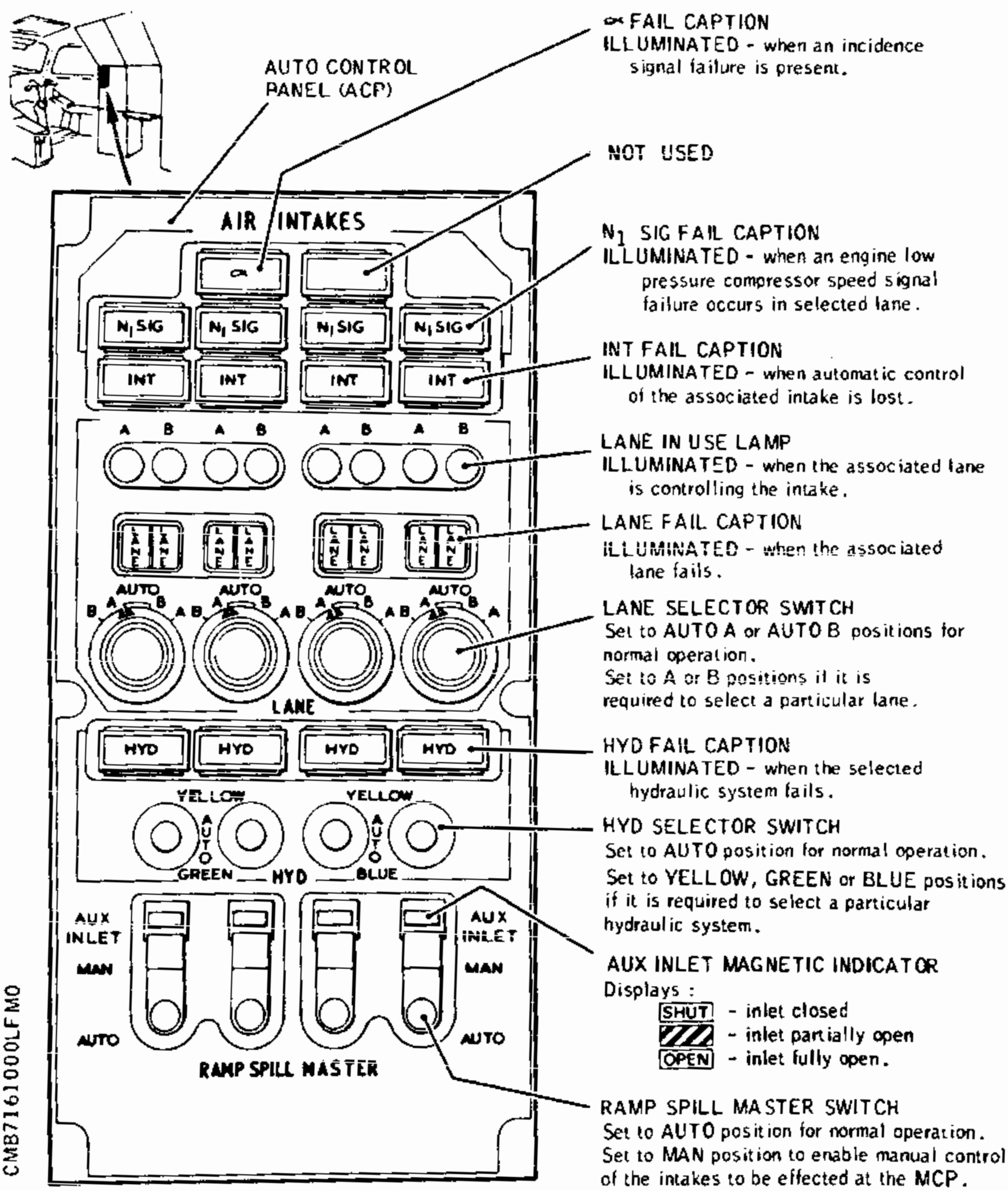
(1) 'Soft failures' indicated by illumination of the following captions:-

(a) Alpha, which indicates a failure of the associated signal but does not effect an automatic lane change-over. The AICS continues to operate on the selected control lane with a preset signal value substituted for the failed signal.

(b) N1 SIG, which indicates a failure of the N1 signal and effects an automatic lane change-over in the automatic mode. If the N1 failure is also present in the other lane control of the AICS will be maintained, but if required, the de-selected lane can be re-selected manually.

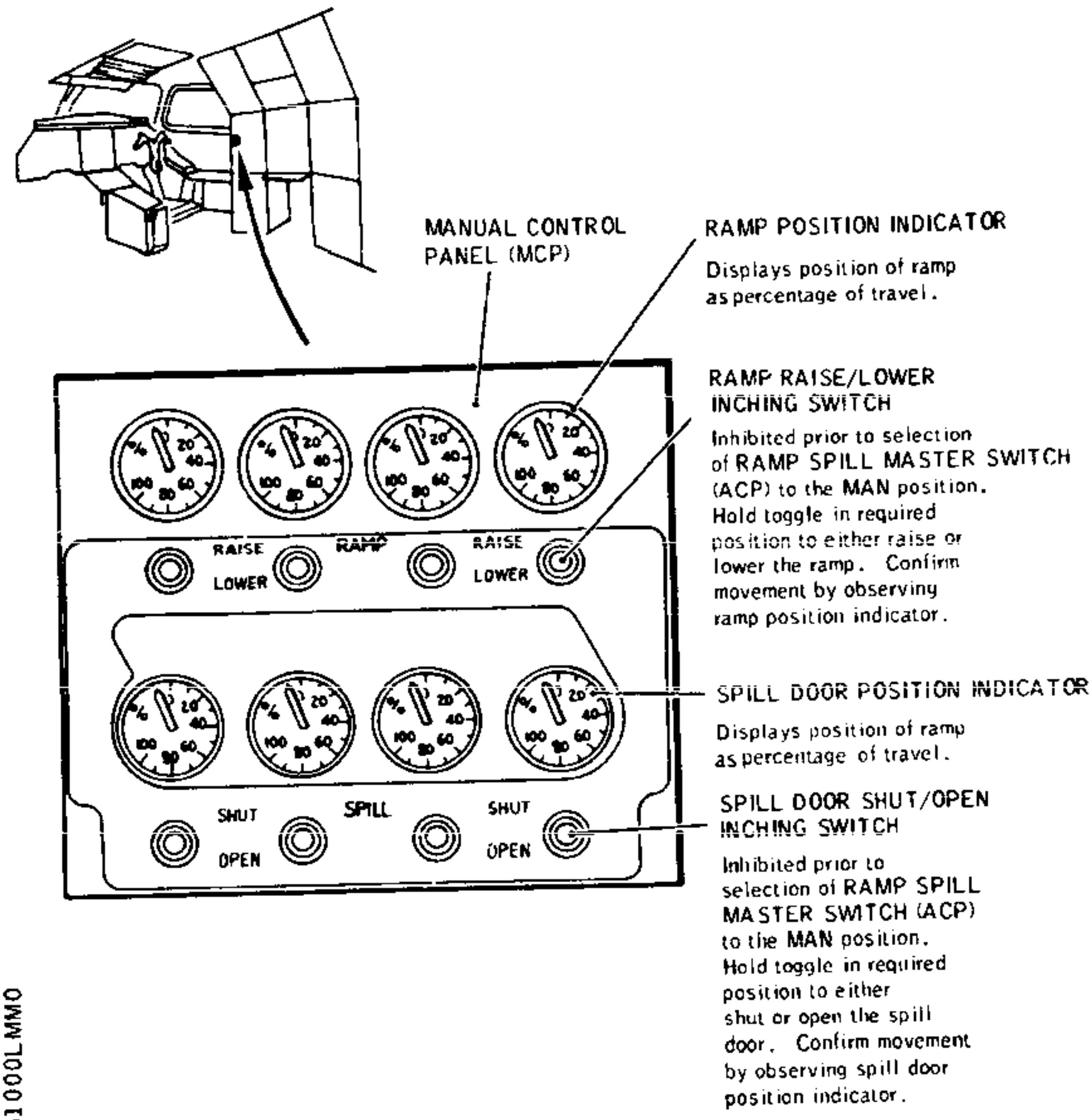
(2) 'Hard failures', indicated by illumination of the LANE or HYD failure captions. These failures render the selected control lane or hydraulic system inoperable and effect an automatic change-over in the automatic mode.

(3) Complete failure of automatic control of the intake,



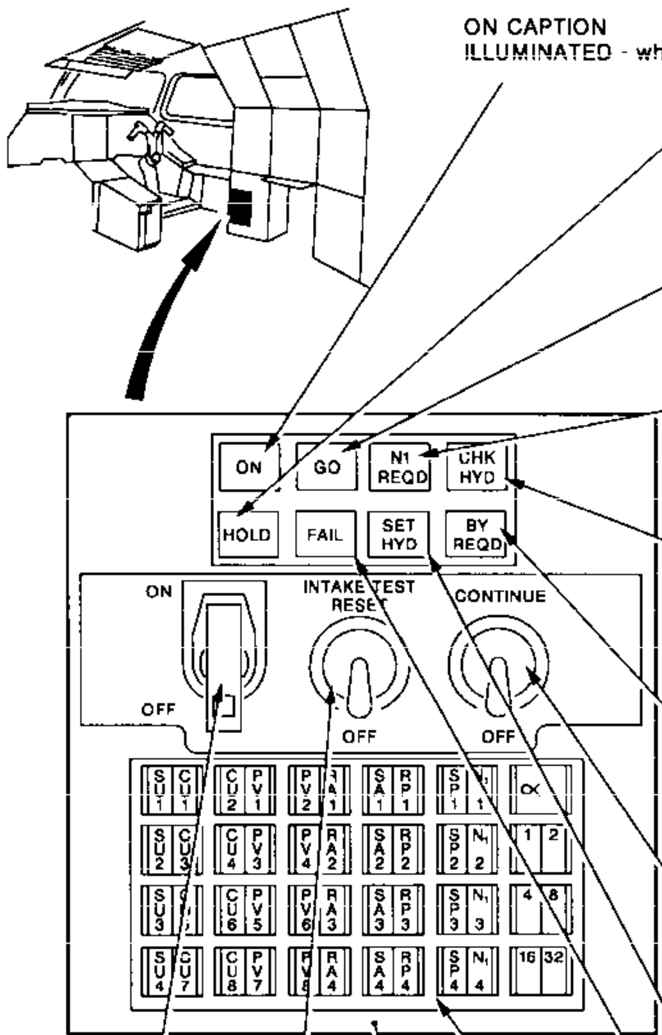
CMB7161000LFMO

System Management - Automatic Control
Figure 033



CMB7161000LMM0

System Management - Manual Control
Figure 034



ON CAPTION
ILLUMINATED - when the intake test ON/OFF switch is set to ON.

HOLD CAPTION
ILLUMINATED - when a failure condition is detected and the pre-flight check sequence is stopped. Extinguished when the pre-flight check is continued and/or reset.

GO CAPTION
ILLUMINATED - when a pre-flight check is successfully completed. Extinguished when intake test ON/OFF switch is set to OFF.

N1 REQD. CAPTION
ILLUMINATED - when the pre-flight sequence requires an N1 signal input and the engines are not running. Extinguished when intake test ON/OFF switch is set to OFF.

CHK HYD CAPTION
ILLUMINATED - when a green/yellow hydraulic supply combination is required to be set for a pre-flight check on Nos.1 and 2 intakes. Extinguished when green and yellow hydraulics are pressurized with blue hydraulics de-pressurized.

B/Y REQD. CAPTION
ILLUMINATED - when a blue/yellow hydraulic supply combination is required to be set for a pre-flight check on Nos. 3 and 4 intakes. Extinguished when blue and yellow hydraulics are pressurized with green hydraulics depressurized.

CONTINUE/OFF SWITCH
Normally at OFF position. Set to CONTINUE position to start the pre-flight check, cancel a failure hold condition and to continue the pre-flight check programme.

SET HYD CAPTION
-not used.

AIR INTAKE TEST PANEL

FAIL CAPTION
ILLUMINATED - when a failure condition is detected. Extinguished when the pre-flight check is reset or continued. Re-illuminated at completion of test sequence to indicate presence of fault condition.

RESET/OFF SWITCH
Normally at OFF position.
Set to RESET position to re-start a pre-flight check.

EQUIPMENT FAILURE CAPTIONS
ILLUMINATED when a failure is detected in associated equipment in flight, and during pre-flight checks. Extinguished when fault is rectified.

ON/OFF PRE-FLIGHT CHECK SWITCH
Normally at OFF position.
Set to ON position to initiate pre-flight check.

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System Management - Pre-Flight Check and Equipment Failures
Figure 035

indicated by illumination of the INT failure caption and the appropriate LANE and/or HYD failure captions.

Normally, the lane selector switches are set in either the AUTO A or AUTO B positions, the hydraulic selector switches are set at AUTO, the RAMP - SPILL MASTER switches are guarded in the AUTO position, the appropriate A or B green 'lane in use' indicating lamps are lit, and the ramp and spill door position indicators display the position of the ramp and spill doors; all warning captions are extinguished.

A subsequent automatic lane change initiated by an N1 signal failure is indicated by illumination of the N1 SIG failure caption and the change-over of the A and B green 'lane in use' indicator lamps accompanied by illumination of the associated LANE failure caption and appropriate amber INT master warning caption. The N1 SIG caption will remain lit until the failure is acknowledged by manually selecting the 'lane in use'. As this is a 'soft failure', if required, the original control lane can be manually re-selected.

An automatic change initiated by a lane failure signal is indicated by illumination of the appropriate LANE failure caption accompanied by illumination of the amber INT master warning caption, and the change-over of the green 'lane in use' indicating lamps. The LANE failure caption will remain illuminated regardless of the position of the lane selector switch, but the master warning can be cancelled by selecting the appropriate A or B switch positions.

Failure of the operating lane, following an automatic lane change, will result in complete automatic control failure in the related intake accompanied by the extinguishing of the 'lane in use' lamp, the illumination of the LANE and INT failure captions and the amber and red INT master warning captions. In this condition the ramp and spill door are locked in the last demanded position.

An automatic hydraulic system change-over is indicated by illumination of the appropriate HYD failure caption accompanied by illumination of the amber INT master warning caption. The HYD failure caption will remain illuminated until the failure is acknowledged by manual selection of the YELLOW position at the hydraulic selector switch. A subsequent pressure failure in the yellow standby hydraulic system will result in complete automatic control failure in the related intake accompanied by illumination of the HYD and INT failure captions and the amber and red INT master warning captions. In this condition, the ramp and spill door are locked in the last demanded position.

A hydraulic low level failure in the yellow standby hydraulic system locks the spill door only; control of the ramp is maintained and the HYD, INT fail and amber and red INT master warnings are not given.

After a complete control failure, initiated by a double lane failure, remedial action can be taken if the ramp and spill door have to be repositioned. This is effected by placing the appropriate RAMP - SPILL MASTER switch on the ACP in the MAN position which, in turn, enables the ramp and spill inching switches on the MCP to be used. This manual control allows direct operation of the ramps and/or spill doors while monitoring the ramp and spill door positions on the adjacent ramp and spill position indicators and the intake pressure ratio error on the intake pressure ratio error indicators; control of the hydraulic systems is retained by the HYD selector on the ACP. In general, use of this facility will be confined to inching the ramps fully up and the spill door closed, to obtain the intake landing configuration. Manual control is also available on the ground to facilitate maintenance practices and as a complementary facility to the automated pre-flight check. The manual facility is not available if both hydraulic supplies have failed.

R

The pre-flight check is selected, on the ground only, with the lane selector switches at AUTO A and the hydraulic selector and RAMP - SPILL MASTER switches at AUTO.

R

Prior to setting the ON - OFF switch on the AITP to ON the AICS GROUND - FLIGHT switches must be set to GROUND.

When the ON - OFF switch on the AITP is set to the ON position, power is supplied to the pre-flight check circuits in the AITU, AISUs and AICUs and illuminates the ON caption on the AITP. Provided that all three hydraulic systems (yellow, blue and green) are pressurized, no other captions are illuminated, and the pre-flight check is started by placing the CONTINUE - OFF switch in the CONTINUE position and then returning it to the OFF position. The pre-flight check is then carried out on intakes 1, 2, 3 and 4 simultaneously. If any discrepancies are detected, the program is stopped, the HOLD caption is illuminated, the binary pattern address is displayed and the appropriate equipment failure caption is illuminated. In addition a fail signal is generated which will illuminate the FAIL caption at the end of the test program.

The program is continued by setting the CONTINUE switch to the CONTINUE position and then returning it to the OFF position; the program then advances until the end unless

any subsequent failures are detected, in which case the program is stopped as previously described and is restarted again by operating the CONTINUE switch.

At the end of the check program either the GO or the FAIL caption is illuminated, depending on whether or not any failures were detected during the program.

If any of the engines are not running at the time the N1 probes are checked the N1 REQD caption is illuminated. After starting the engine(s) the N1 REQD caption is extinguished and the program is continued by operating the CONTINUE switch.

If the pre-flight check is selected with the engines not running, only two of the three hydraulic systems can be pressurized by the aircraft electromechanical hydraulic pumps, and if green and yellow are not pressurized the CHKHYD caption is illuminated. In this condition the RAMP - SPILL MASTER switches for intakes 3 and 4, on the ACP, are set to the MAN position, and the green and yellow hydraulics are selected at the hydraulic control panel (Ref. Chap.29). When both systems are pressurized the CHK HYD caption is extinguished and the test continued by operating the CONTINUE switch. At the completion of the checks on intakes 1 and 2 the B/Y REQD caption is illuminated. In this condition the RAMP - SPILL MASTER switches for intakes 3 and 4 are set to AUTO and for intakes 1 and 2 to MAN, and the blue and yellow hydraulics are selected at the hydraulics control panel. When both systems are pressurized the B/Y REQD caption is extinguished and the test is then started on intakes 3 and 4 by operating the CONTINUE switch.

At the completion of the checks on intakes 3 and 4 the N1 REQD caption is illuminated to indicate that all engines must be running before the program can be completed. In this condition the RAMP - SPILL MASTER switches for intakes 1 and 2 are set to AUTO and the engines started. When all engines are running the N1 REQD caption is extinguished and the test is then continued by operating the CONTINUE switch.

Failures detected during this test are indicated as previously described, and either the GO or FAIL caption is illuminated at the completion of the program, depending on whether or not any failures were detected during the program.

INTAKE CONTROL SYSTEM - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

This topic contains instructions for the removal and installation of minor electrical components in the AICS system as follows:-

(1) Control unit deselect delay relays.

R (2) Ground/Flight switches.

2. Control Unit Deselect Delay Relay

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare to Remove Control Unit Deselect Delay Relay

(1) Set the associated intake RAMP - SPILL MASTER switch to "MAN".

(2) Electrically isolate the lane associated with the relay by tripping the appropriate circuit breaker as follows. Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
No. 1 intake lane A			
INTERFACE UNIT 1A/2B SUP	1-213	1K1976	H9
No.1 intake lane B			
INTERFACE UNIT 2A/1B SUP	15-215	2K1976	D18

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
No.2 intake lane A			
INTERFACE UNIT 2A/1B SUP	15-215	2K1976	D18
No.2 intake lane B			
INTERFACE UNIT 1A/2B SUP	1-213	1K1976	H9
No.3 intake lane A			
INTERFACE UNIT 3A/4B SUP	5-213	3K1976	D6
No.3 intake lane B			
INTERFACE UNIT 4A/3B SUP	15-216	4K1976	D8
No.4 intake lane A			
INTERFACE UNIT 4A/3B SUP	15-216	4K1976	D8
No.4 intake lane B			
R INTERFACE UNIT 3A/4B SUP	5-213	3K1976	D6

(3) Remove the appropriate cover from the rear equipment racking and locate the AICS interface unit on shelf 4-243, 4-244, 5-243 or 5-244, as required.

(4) Locate the relay, designated REL 3 in lane A and REL 4 in lane B, in the rear equipment racking on the upper surface of the associated interface unit (Ref. Table 401).

LANE	INTAKE NO.	RELAY	INTERFACE UNIT NO.	ZONE
A	1	REL 3	1	5-243
A	2	REL 3	2	4-243
A	3	REL 3	3	4-244
A	4	REL 3	4	5-244
B	1	REL 4	2	4-243
B	2	REL 4	1	5-243
B	3	REL 4	4	5-244
B	4	REL 4	3	4-244

Relay Location
Table 401

C. Remove Control Unit Deselect Delay Relay

(1) Release the securing clip retaining the relay to the relay base. Withdraw the relay vertically.

D. Install Control Unit Deselect Delay Relay

(1) Comply with the electrical safety precautions.

(2) Correctly orientate the relay and insert it into the relay base.

(3) Secure the relay in position with the retaining clip; ensure that the clip is correctly positioned in the depression in the relay cap.

E. Conclusion

(1) Refit and secure the cover to the rack.

(2) Remove the safety clips and reset the circuit breakers tripped before removal.

(3) Carry out the appropriate Preliminary Test as detailed in 71-61-00, Adjustment/Test,

'3. Operational Test (Excluding Ramp Manual Inching Spill Door Manual Inching and Auxiliary Inlets)'.

R

3. AICS GROUND - FLIGHT Switch

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare to Remove AICS GROUND - FLIGHT Switch

(1) Electrically isolate the RAM AIR TURBINE test panel by tripping the following circuit breakers. Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
RAT TEST & NO 1 CART SUP	1-213	M761	R17
STATIC INV SUPPLY	1-213	X138	N10
RAT IND & NO 2 CART SUP	3-213	M762	B10
3CM STN LH LT TEST SUP 1	15-216	L1003	C12
3CM STN LH LT TEST SUP 2	15-216	L1004	C13
TEST PNL SUP	15-216	K1755	C8
3CM STN PNL LTS SUP	14-216	L86	D9

(2) Locate the RAM AIR TURBINE test panel (panel 14-214) on the left-hand side of the 3CM station.

(3) Release the four quick-release fasteners and withdraw the panel to gain access to the electrical connectors; disconnect each connector.

C. Remove AICS GROUND - FLIGHT Switch

(1) Remove the dust cover from the panel.

(2) Raise the switch guard on the switch and release the hexagon retaining nut, switch guard and washer; withdraw the switch from the rear of the panel.

(3) Disconnect the cables from the switch; identify each cable to facilitate reconnection.

D. Install AICS GROUND - FLIGHT Switch

(1) Comply with the electrical safety precautions.

(2) Connect the electrical cables to the switch, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(3) Correctly orientate the switch and insert it in the panel; position the switch guard and washer, and retain them in position with the hexagon nut; make good any cable ties disturbed during removal.

(4) Set all AICS GROUND - FLIGHT switches to "FLIGHT".

(5) Set the replaced switch to the "GROUND" position. At the associated connector U2739, U2740, U2741 or U2742, check open circuit between pins 1 and 15, 1 and 9 and continuity between pins 1 and 8, and 9 and 15.

(6) Check continuity between pin 13 of connector U2739 and pin 3 of connector U2741.

(7) Set the replaced switch to the "FLIGHT" position. At the associated connector U2739, U2740, U2741 or U2742, check continuity between pins 1, 9 and 15 and open circuit between pins 1 and 8.

(8) Check open circuit between pin 13 of connector U2739 and pin 3 of connector U2741.

(9) If switch K1758, K1759 or K1760 has been replaced, set switch K1757 to "GROUND". Check continuity between pin 13 of connector U2739 and pin 3 of connector U2741.

(10) Refit and secure the dust cover.

(11) Set the four AICS GROUND - FLIGHT switches to "FLIGHT" and position the switch guards to

retain the switches at this position.

(12) Ensure that the two RAM AIR TURBINE TEST - OFF - ON switches are set to OFF and that the switch guards are wire-locked to preclude setting to the ON position.

(13) Connect the electrical connectors to the panel, ensuring that the mating surfaces are clean and undamaged and that the connector identifications correspond.

(14) Position the panel in the rack structure and secure it in position with the four quick-release fasteners.

E. Conclusion

(1) Reset the circuit breakers tripped before removal, with the exception of circuit breaker X138.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Hold the LIGHTS TEST switch on control panel 12-214 in the "TEST" position and check that all caption filaments on the RAM AIR TURBINE test panel are illuminated; release the switch and ensure that all captions are extinguished.

(4) Set the PANEL lighting control switch on lighting control panel 11-214 to the 'on' position. Check that the test panel engravings are illuminated; return the switch to the "OFF" position.

(5) Carry out the Operational Test of the Ram Air
R Turbine, as detailed in 29-24-00, Adjustment/Test.

(6) Reset circuit breaker X138.

(7) Carry out the Operational Test of the Static Inverter 115 V AC as detailed in 24-24-12, Adjustment/Test.

(8) Carry out the appropriate Preliminary Test as detailed in 71-61-00, Adjustment/Test,
R '3. Operational Test (Excluding Ramps Manual
R Inching, Spill Doors Manual Inching and Auxiliary Inlets)'.

INTAKE CONTROL SYSTEM - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

1. General

The adjustment procedures detail the operations required to adjust the rate of travel of the ramps and spill doors in the manual operating modes. Adjustments required to correlate the ramps and spill doors position indicators with the actual ramps and spill doors positions are detailed in 71-63-14 and
R 71-64-16, Adjustment/Test respectively.

The test procedures comprise Operational and Functional Tests.

For convenience of application the Operational Test has been written as four separate procedures, as follows:

Operational Test (excluding Ramps Manual Inching, Spill Doors Manual Inching and Auxiliary Inlets).

Operational Test - Ramps Manual Inching.

Operational Test - Spill Doors Manual Inching.

Operational Test - Auxiliary Inlets.

These tests may be performed independently as required, but to effect a complete Operational Test of the system all four tests must be completed.

At the conclusion of individual tests certain operations, e.g., switching off electrical ground power, may be omitted, provided that a sequential test validates the omission.

2. Adjustment - Ramp and Spill Door Rate of Travel in Manual Mode

A. Equipment and Materials

DESCRIPTION	PART NO.
Stopwatch	-

B. Prepare

(1) Make available electrical ground power as detailed

in 24-41-00.

(2) Ensure that the four intakes and the areas below the spill doors are clear of persons and equipment.

(3) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes.

(4) Display placards, warning of ramp and spill door operation, in the ramp and spill door areas.

R (5) Pressurize the main (GREEN and BLUE) and standby (YELLOW) hydraulic systems (Ref.29-00-00); ensure that the hydraulic operating pressures are normal.

(6) At the auto control panel select the GREEN and BLUE hydraulic systems and set the RAMP - SPILL MASTER switches to "MAN". Press-to-cancel the red INT master warning captions (Ref. 33-15-00).

C. Check and Adjust

(1) Hold No.1 intake RAMP switch at "RAISE" to fully raise the ramps.

(2) Hold No.1 intake RAMP switch at "LOWER" and check that the ramp is fully lowered, including snubbing, within 4.9 to 5.4 s. If the time taken is outside these limits adjust No.1 intake ramp LOWER potentiometer at No.1 interface unit on the rear equipment racking, 5-243. Successively raise the ramp and repeat the operation until the time taken is within limits.

(3) Hold No.1 intake RAMP switch to "RAISE" and check that the ramp is fully raised, including snubbing, within 7.5 to 8.9 s. If the time taken is outside these limits adjust No.1 intake ramp RAISE potentiometer at No.1 interface unit on the rear equipment racking, 5-243. Successively lower the ramp and repeat the operation until the time taken is within limits; ensure that the ramp is left in the fully raised position.

(4) Hold No.1 intake SPILL switch at "CLOSE" to fully raise the spill door.

(5) Hold No.1 intake SPILL switch at "OPEN" and check

that the spill door is fully opened, within 7.3 to 8.2 s. If the time taken is outside these limits adjust No.1 intake spill door OPEN potentiometer at No.1 interface unit on the rear equipment racking 5-243. Successively shut the spill door and repeat the operation until the time taken is within limits.

(6) Hold No.1 intake SPILL switch at "SHUT" and check that the spill door is fully closed, within 10.2 to 11.8 s. If the time taken is outside these limits adjust No.1 intake spill door SHUT potentiometer at No.1 interface unit on the rear equipment racking, 5-243. Successively open the spill door and repeat the operation until the time taken is within limits; ensure that the spill door is left in the fully closed position.

(7) Set the No.1 intake hydraulic selector to the "YELLOW" position.

R (8) Hold No.1 intake RAMP switch at "LOWER" and check that the ramp is fully lowered, including snubbing, within 4.9 to 5.4 s. If the time taken is outside these limits adjust No.1 intake ramp LOWER potentiometer at No.2 interface unit on the rear equipment racking, 4-243. Successively raise the ramp and repeat the operation until the time taken is within limits.

(9) Hold No.1 intake RAMP switch at "RAISE" and check that the ramp is fully raised, including snubbing, within 7.5 to 8.9 s. If the time taken is outside these limits adjust No.1 intake ramp RAISE potentiometer at No.2 interface unit on the rear equipment racking, 4-243. Successively lower the ramp and repeat the operation until the time taken is within limits; ensure that the ramp is left in the fully raised position.

(10) Hold No.1 intake SPILL switch at "OPEN" and check that the spill door is fully opened, within 7.3 to 8.2 s. If the time taken is outside these limits adjust No.1 intake spill door OPEN potentiometer at No.2 interface unit on the rear equipment racking, 4-243. Successively shut the spill door and repeat the operation until the time taken is within limits.

(11) Hold No.1 intake SPILL switch at "SHUT" and check that the spill door is fully closed, within 10.2

to 11.8 s. If the time taken is outside these limits adjust No.1 spill door SHUT potentiometer at No.2 interface unit on the rear equipment racking, 4-243. Successively open the spill door and repeat the operation until the time taken is within limits; ensure that the spill door is left in the fully closed position.

(12) Repeat operations (1) to (11) inclusive as applied to intakes 2, 3 and 4, in turn, by the substitution of the appropriate potentiometers shown in Table 501.

INTAKE	HYDRAULICS IN USE	INTERFACE UNIT	POTENTIO-METER	ZONE
No.1 ramp-lower	Green	No.1	LOWER	5-243
No.1 ramp-raise	Green	No.1	RAISE	5-243
No.1 spill door-open	Green	No.1	OPEN	5-243
No.1 spill door-shut	Green	No.1	SHUT	5-243
No.1 ramp-lower	Yellow	No.2	LOWER	4-243
No.1 ramp-raise	Yellow	No.2	RAISE	4-243
No.1 spill door-open	Yellow	No.2	OPEN	4-243
No.1 spill door-shut	Yellow	No.2	SHUT	4-243
No.2 ramp-lower	Green	No.2	LOWER	4-243
No.2 ramp-raise	Green	No.2	RAISE	4-243
No.2 spill door-open	Green	No.2	OPEN	4-243
No.2 spill door-shut	Green	No.2	SHUT	4-243
No.2 ramp-lower	Yellow	No.1	LOWER	5-243
No.2 ramp-raise	Yellow	No.1	RAISE	5-243
No.2 spill door-open	Yellow	No.1	OPEN	5-243
No.2 spill door-shut	Yellow	No.1	SHUT	5-243
No.3 ramp-lower	Blue	No.3	LOWER	4-244
No.3 ramp-raise	Blue	No.3	RAISE	4-244
No.3 spill door-open	Blue	No.3	OPEN	4-244
No.3 spill door-shut	Blue	No.3	SHUT	4-244
No.3 ramp-lower	Yellow	No.4	LOWER	5-244

INTAKE	HYDRAULICS IN USE	INTERFACE UNIT	POTENTIO-METER	ZONE
No.3 ramp-raise	Yellow	No.4	RAISE	5-244
No.3 spill door-open	Yellow	No.4	OPEN	5-244
No.3 spill door-shut	Yellow	No.4	SHUT	5-244
No.4 ramp-lower	Blue	No.4	LOWER	5-244
No.4 ramp-raise	Blue	No.4	RAISE	5-244
No.4 spill door-open	Blue	No.4	OPEN	5-244
No.4 spill door-shut	Blue	No.4	SHUT	5-244
No.4 ramp-lower	Yellow	No.3	LOWER	4-244
No.4 ramp-raise	Yellow	No.3	RAISE	4-244
No.4 spill door-open	Yellow	No.3	OPEN	4-244
No.4 spill door-shut	Yellow	No.3	SHUT	4-244

Ramp and Spill Door Manual Inching Setting Potentiometers
Table 501

D. Conclusion

(1) Depressurize the GREEN, BLUE and YELLOW hydraulic
R systems (Ref.29-00-00), and set the hydraulic select switches to "AUTO".

(2) Remove all barriers and warning placards.

(3) Switch off and disconnect electrical ground power as detailed in 24-41-00.

3. <u>Operational Test (excluding Ramps Manual Inching, Spill Doors Manual Inching and Auxiliary Inlets)</u>

<u>NOTE:</u> Three separate procedures for carrying out a preliminary test of the system are detailed; the first uses three ground hydraulic supplies (Ref.

para.A.), the second, one ground hydraulic supply and two aircraft ground hydraulic check-out pumps (Ref. para.B.), the third, two aircraft ground hydraulic check-out pumps (Ref. para.C.).

These tests are optional methods of testing the AICS prior to the tests which require the engines to be running (Ref. para.D.).

A. Preliminary Test in Conjunction with Three Ground Hydraulic Test Rigs

(1) Prepare

(a) Make available electrical ground power as detailed in 24-41-00.

(b) Ensure that for the duration of the test -

b1) the equipment racking air extraction system (Ref. 21-21-00) is operating, and

b2) the four intakes and the areas below the spill doors remain clear of persons and equipment.

(c) Post notices, warning of AICS Operational Test in progress, and position barriers to prevent persons from inadvertently entering the area in the vicinity of the ramps and spill doors.

(d) Check that the master warning system (MWS) (Ref. 33-15-00) and the associated audio warning system (AWS) (Ref. 31-23-00) are operating.

(e) Make available hydraulic ground power to the main hydraulic systems (GREEN and BLUE) and to the standby hydraulic system (YELLOW) (Ref.
R 29-00-00); ensure that the hydraulic operating pressures are normal.

(f) Ensure that the MWS red and amber INT captions are extinguished; cancel them if necessary.

(g) Test the filaments (Ref. 33-14-00) on the auto control panel (ACP), the air intake test panel (AITP) and the auto N1 reduce lamp on the N1
R indicator (Ref.71-00-00).

(2) Test

(a) Set the RAMP - SPILL MASTER switches to "MAN". Check that the INT fail captions on the ACP and the MWS red INT captions are illuminated, accompanied by the single-stroke gong; press-to-cancel the MWS red INT captions.

NOTE: If the master warning system (red) is not cancelled the single-stroke gong tone is repeated at approximately 8 s intervals.

(b) At the ACP set -

b1) the four lane select switches to "A",

b2) the four hydraulic select switches to "YELLOW" and

b3) confirm that the ramp and spill position indicators display 0 per cent.

(c) Using the RAMP RAISE - LOWER inching switches, lower each ramp approximately 20 per cent and then return it to the fully-up position (0 per cent).

R (d) Using the SPILL SHUT - OPEN inching switches, open each spill door approximately 20 per cent, wait for 3 s and check that during this time the spill door does not move and then return it to the fully closed position (0 per cent).

(e) Set the four hydraulic select switches to "AUTO".

(f) Repeat operations (c) and (d).

(g) Set the four RAMP - SPILL MASTER switches to "AUTO". Check that -

g1) the alpha, INT, LANE and HYD failure captions, the lane B lane-in-use lamps and the N1 reduce lamps on the N1 indicators are extinguished,

g2) the lane A lane-in-use lamps and the N1 SIG fail captions are illuminated, accompanied by the amber INT master warnings, and

g3) the pointers on all four pressure ratio error indicators are at the twelve o'clock position.

(h) Set the four RAMP - SPILL MASTER switches to "MAN".

(i) Press-to-cancel the MWS red INT captions.

(j) Press-to-test the N1 SIG, LANE and HYD failure captions on the ACP, in turn. Check that each caption is illuminated and the associated MWS amber INT caption is illuminated, accompanied by the sounding of a single-stroke gong.

(k) Press-to-test the alpha fail caption on the ACP. Check that the caption is illuminated and the four MWS amber INT captions are illuminated, accompanied by the sounding of a single-stroke gong.

(l) Set the four lane select switches to "AUTO A".

(m) At the ram air turbine (RAT) test panel (Ref. 29-24-00) set the AICS GROUND - FLIGHT switch for No.1 intake to "GROUND" and check that the MWS red INT caption for each intake is illuminated, accompanied by a single-stroke gong. Return the switch to the "FLIGHT" position and check that the MWS red INT captions are extinguished.

(n) Repeat operation (m) as applied to the No.1 intake AICS GROUND - FLIGHT switch for Nos. 2, 3 and 4 intakes, in turn.

(p) At the AITP set the intake test ON - OFF switch to "ON" and check that the ON caption and the MWS red INT caption for each intake are illuminated, accompanied by a single-stroke gong. Return the switch to "OFF" and check that the ON caption and the MWS red INT captions are extinguished.

(q) Set the AICS GROUND - FLIGHT switches to "GROUND" and the AITP intake test ON - OFF switch to "ON". Check that the HOLD caption is illuminated after a delay of approximately 7 s.

NOTE: A random light pattern will occur on

the ACP and AITP until the test program is commenced by use of the CONTINUE - OFF switch.

(r) Press-to-cancel the MWS red INT captions.

(s) Set the four RAMP - SPILL MASTER switches to "AUTO".

(t) Start the test program by setting the CONTINUE - OFF switch on the AITP to "CONTINUE":

t1) Verify the correct operation of the failure captions on the ACP by observing that each caption is illuminated at least once during the test program.

NOTE: Operation of the associated master warnings by the failure captions has been previously checked in operations (j) and (k).

t2) Check that the HOLD caption is extinguished and remains extinguished, and that after approximately 5 min the N1 REQD caption is illuminated.

NOTE: Illumination of the N1 REQD caption, provided that the HOLD caption has not been re-illuminated during the test program, indicates the successful completion of the preliminary test. The GO caption can be illuminated only on the successful completion of the N1 probe checks, which require all engines to be running (Ref. para.D.).

Illumination of the HOLD caption during the test, accompanied by the appropriate equipment failure caption and a binary pattern address display, indicates that a failure has been detected and that the test sequence has stopped. Table 502 lists the binary pattern numbers and defines the expected result for each pattern. The pattern number is determined by adding together the illuminated numbers on the AITP binary address. The test sequence can be continued by resetting the CONTINUE - OFF switch to "CONTINUE".

The RESET switch on the AITP allows the test program to be reset to the beginning at any time during the test sequence.

(u) Check that the pointers on all four pressure ratio error indicators are at the twelve o'clock position.

CAPTION	ALP-HA	N1 SIG	INT	LANE-IN-USE	LANE	HYD	N1 REDUCE
INTAKE	ALL	1234	1234	11223344	11223344	1234	1234
LANE				ABABABAB	ABABABAB		
PATTERN							
01	-	----	----	*-*-*-*-	--------	----	----
02	-	----	----	*-*-*-*-	--------	----	**--
03	-	----	----	*-*-*-*-	--------	----	--**
04	-	****	----	-*-*-*-*	*-*-*-*-	----	----
05	-	****	----	-*-*-*-*	*-*-*-*-	----	**--
06	-	****	----	-*-*-*-*	*-*-*-*-	----	--**
07	-	----	----	*--**--*	--*---*-	-*-*	----
08	-	----	**--	-----*-*	*****-*-	****	----
09	-	----	****	--------	********	****	----
10	-	----	----	*-*-*-*-	--------	-*-*	----
11	-	****	----	-*-*-*-*	*-*-*-*-	-*-*	----
12	-	****	****	--------	********	----	----
13	-	----	****	--------	********	----	----
14	*	----	****	--------	********	----	----
15	"NONSENSE PATTERN" to ensure that the AITU can produce a FAIL at beginning of sequence.						
16	-	----	----	-*-**-*-	*-*-----	**--	----
17	-	----	----	-**--**-	*---*---	*-*-	----
18	-	----	----	*-*-*-*-	--------	*-*-	----
19	-	****	----	-*-*-*-*	*-*-*-*-	*-*-	----
20	-	****	****	--------	********	*-*-	----
21	-	****	****	--------	********	-*-*	----
22	*	----	****	--------	********	----	----
23	*	----	****	--------	********	----	----
24	-	----	****	--------	********	----	----
25	-	----	-*--	-*---**-	*-***---	----	----
26	-	----	----	--------	--------	----	----
27	-	----	****	========	********	====	====
28	*	----	****	--------	********	----	----
29	-	----	----	-**-*-*-	*------*	----	----
30	-	----	**--	-----*-*	*****-*-	----	----
31	-	----	----	--------	--------	----	----
32	-	----	****	--------	********	----	----
33	-	----	----	-*-**-*-	*-*-*---	----	----
34	*	----	****	--------	********	----	----
35	-	----	****	--------	********	----	----
36	-	----	----	--------	--------	----	----
37	-	----	****	--------	********	----	----
38	-	----	----	*-*-*-*-	--------	----	----
39	-	----	----	--------	--------	----	----
40	-	****	----	-*-*-*-*	*-*-*-*-	*-*-	----
41	-	****	----	-*-*-*-*	*-*-*-*-	----	----
42	-	****	----	-*-*-*-*	*-*-*-*-	-*-*	----
43	-	****	****	--------	********	----	----

CAPTION	ALP-HA	N1 SIG	INT	LANE-IN-USE	LANE	HYD	N1 REDUCE
INTAKE	ALL	1234	1234	11223344	11223344	1234	1234
LANE				ABABABAB	ABABABAB		
PATTERN							
44	-	****	****	--------	********	----	----
45	-	----	****	--------	********	----	----
46	-	****	****	--------	********	----	----
47	-	****	****	--------	********	----	----
48	-	****	-*-*	-*---*--	*-***-**	*-*-	----
49	-	****	*-*-	---*---*	***-***-	-*-*	----

AITP Binary Pattern Number With Expected ACP and N1 Reduce Display (Illuminated Captions Shown Thus *)
Table 502

(3) Conclusion

(a) Set the intake test ON - OFF switch to "OFF"; close and wire-lock the switch guard in accordance with 20-21-13. Check that the ON caption on the AITP is extinguished.

(b) Set the AICS GROUND - FLIGHT switches to "FLIGHT" and position the switch guards to maintain the switches at the "FLIGHT" position.

(c) Press the MWS RECALL push-switch and check that the MWS red INT captions remain extinguished.

(d) Set the RAMP - SPILL MASTER switches to "MAN". Press-to-cancel the MWS red INT captions.

(e) Set the RESET - OFF switch on the AITP to "RESET" and release it. Ensure that all captions on the AITP are extinguished.

(f) Switch off and disconnect electrical ground
R power as detailed in 24-41-00.

(g) Disconnect and remove the ground hydraulic supply rigs (Ref.29-00-00).

(h) Remove all barriers and warning placards.

B. Preliminary Test - in Conjunction with One Ground Hydraulic Supply and Two Aircraft Ground Hydraulic Check-Out Pumps

(1) Prepare

(a) Make available electrical ground power as detailed in 24-41-00.

(b) Connect the ground hydraulic supply to the
R yellow hydraulic system (Ref.29-00-00).

(c) Ensure that for the duration of the test -

c1) the equipment racking air extraction system (Ref. 21-21-00) is operating and

c2) the four intakes and the areas below the spill doors remain clear of persons and equipment.

(d) Post notices, warning of AICS Operational Test in progress, and position barriers to prevent persons from inadvertently entering the area in the vicinity of the ramps and spill doors.

(e) Check that the master warning system (MWS) (Ref. 33-15-00) and the associated audio warning system (AWS) (Ref. 31-23-00) are operating.

(f) Ensure that the MWS red and amber INT captions are extinguished; cancel them if necessary.

(g) Test the filaments (Ref. 33-14-00) on the ACP, the air intake test panel (AITP) and the auto N1 reduce lamp on the N1 indicators (Ref.
R 71-00-00).

(2) Test

(a) Set the RAMP - SPILL MASTER switches to "MAN". Check that the INT captions on the auto control panel (ACP) and the MWS red INT captions are illuminated, accompanied by the single-stroke gong; press-to-cancel the MWS red INT captions.

<u>NOTE:</u> If the master warning system (red) is not cancelled the single-stroke gong tone is repeated at approximately 8 s intervals.

(b) At the flying controls servo controls hydraulic selection panel (Ref. 27-34-00) set the upper switch to "BLUE ONLY" and the lower switch to "YELLOW-BLUE". Check that -

b1) the GREEN L. PRESS caption is illuminated, and

b2) the two blue solenoid selector lamps are lit.

(c) At the flying controls relay jacks panel (Ref. 27-34-00) set the selector switch to "BLUE ONLY".

(d) At the ground hydraulics check-out panel (Ref. 29-23-00) set -

d1) the hydraulic selector to "GREEN-BLUE",

d2) the hydraulic pump switch PUMP 1 G-Y to "ON", and

d3) after a short delay the hydraulic pump switch PUMP 2 B-Y to "ON" (both pumps must not be switched on simultaneously).

(e) At the ACP set -

e1) the four lane select switches to "A",

e2) the four hydraulic select switches to "YELLOW" and

e3) confirm that the ramp and spill door indicators display 0 per cent.

(f) Using the RAMP RAISE - LOWER inching switches, lower each ramp, in turn, approximately 20 per cent and then return it to the fully-up position (0 per cent).

R (g) Using the SPILL SHUT - OPEN inching switches, open each spill door, in turn, approximately 20 per cent, wait for 3 s and check that during this time the spill door does not move and then return it to the fully closed position (0 per cent).

(h) At the ACP set the four hydraulic select switches to "AUTO".

(i) Repeat operations (f) and (g).

(j) Set the four RAMP - SPILL MASTER switches to "AUTO". Check that -

j1) the alpha, INT, LANE and HYD failure captions, the lane B lane-in-use lamps and the N1 reduce lamps on the N1 indicators are extinguished, and

j2) the lane A lane-in-use lamps and the N1 SIG fail captions are illuminated, accompanied by the amber INT master warnings.

(k) Set the four RAMP - SPILL MASTER switches to "MAN".

(l) Press-to-cancel the MWS red INT captions.

(m) Press-to-test the N1 SIG, LANE and HYD failure captions on the ACP, in turn. Check that each caption is illuminated and the MWS amber INT caption is illuminated, accompanied by the sounding of a single-stroke gong.

(n) Press-to-test the alpha fail caption on the ACP. Check that the caption is illuminated and the four MWS amber INT captions are illuminated, accompanied by the sounding of a single-stroke gong.

R (p) Set the four lane select switches to "AUTO A".

R (q) At the ram air turbine (RAT) test panel (Ref.
R 29-24-00) set the AICS GROUND - FLIGHT switch
R for No.1 intake to "GROUND" and check that the
R MWS red INT caption for each intake is illumi-
R nated, accompanied by a single-stroke gong.
R Return the switch to the "FLIGHT" position and
R check that the MWS red INT captions are
R extinguished.

R (r) Repeat operation (q) as applied to the No.1
R intake AICS GROUND - FLIGHT switch for Nos. 2,
R 3 and 4 intakes, in turn.

R (s) At the AITP, set the intake test ON - OFF
R switch to "ON" and check that the ON caption
R and the MWS red INT caption for each intake are
R illuminated, accompanied by a single-stroke

R R R gong. Return the switch to "OFF" and check that the ON caption and the MWS red INT captions are extinguished.

R R R R (t) Set the AICS GROUND - FLIGHT switches to "GROUND" and the AITP intake test ON - OFF switch to "ON". Check that the HOLD caption is illuminated after approximately 7 s.

R R R R NOTE: A random light pattern will occur on the ACP and AITP until the test program is commenced by use of the CONTINUE - OFF switch.

R (u) Press-to-cancel the MWS red INT captions.

R (v) Set the RAMP - SPILL MASTER switches to "AUTO".

R R (w) Start the test program by setting the CONTINUE - OFF switch on the AITP to "CONTINUE":

R w1) Verify the correct operation of the failure captions on the ACP by observing that each caption is illuminated at least once during the test program.

NOTE: Operation of the associated master warnings by the failure captions has been previously checked in operations (m) and (n).

R w2) Check that the HOLD caption is extinguished and remains extinguished, and that after approximately 5 min the N1 REQD caption is illuminated.

NOTE: Illumination of the N1 REQD caption, provided that the HOLD caption has not been re-illuminated during the test program, indicates the successful completion of the Preliminary Test. The GO caption can be illuminated only on the successful completion of the N1 probe checks, which require all engines to be running (Ref. para.D.).

Illumination of the HOLD caption during the test, accompanied by the appropriate equipment failure caption and a binary address display, indicates that a failure has been detected and that the

test sequence has stopped. Refer to Table 502 as applied to intakes 1 and 2 for the binary pattern number and the expected result for each pattern. The pattern number is determined by adding together the illuminated numbers on the AITP binary address. The test sequence can be continued by resetting the CONTINUE - OFF switch to "CONTINUE".

The RESET switch on the AITP allows the test program to be reset to the beginning at any time during the test sequence.

(3) Conclusion

(a) Set the intake test ON - OFF switch to "OFF"; close and wire-lock the switch guard in accordance with 20-21-13. Check that the ON caption is extinguished.

(b) Set the AICS GROUND - FLIGHT switches to "FLIGHT" and position the switch guards to maintain the switches at the "FLIGHT" position.

(c) Press the MWS RECALL push-switch and check that the MWS red INT captions remain extinguished.

(d) Set the intake RAMP - SPILL MASTER switches to "MAN". Press-to-cancel the red MWS INT failure captions.

(e) Set the RESET - OFF switch on the AITP to "RESET" and release it. Check that all captions on the AITP are extinguished.

(f) At the ground hydraulics check-out panel set the hydraulic pump switches PUMP 1 G-Y and PUMP 2 B-Y to "OFF".

(g) At the flying controls servo controls hydraulic selection panel set the upper and lower switches to "NORMAL".

(h) At the flying controls relay jacks panel, set the

(j) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(k) Disconnect and remove the ground hydraulic supply (Ref.29-00-00).

(l) Remove all barriers and warning placards. selector switch to "NORM".

R B C. Air Intake Control System Pre-Flight Check - Engines Static
R B Preliminary Test - in conjunction with Two Aircraft Ground
R B Hydraulic Check-out Pumps

(1) Prepare

(a) Make available electrical ground power as detailed in 24-41-00.

(b) Ensure that for the duration of the test -

b1) the equipment racking air extraction system (Ref. 21-21-00) is operating and

b2) the four intakes and the areas below the spill doors remain clear of persons and equipment.

(c) Post notices, warning of AICS Operational Test in progress, and position barriers to prevent persons from inadvertently entering the area in the vicinity of the ramps and spill doors.

(d) Check that the master warning system (MWS) (Ref. 33-15-00) and the associated audio warning system (AWS) (Ref. 31-23-00) are operating.

(e) Ensure that the MWS red and amber INT captions are extinguished; cancel them if necessary.

(f) Test the filaments (Ref. 33-14-00) on the ACP, the air intake test panel (AITP) and the auto N1 reduce lamp on the N1 indicators (Ref. 71-00-00).

(2) Test

(a) Set the RAMP - SPILL MASTER switches to "MAN". Check that the INT captions on the auto control panel (ACP) and the MWS red INT captions are illuminated, accompanied by the single-stroke gong; press-to-cancel the MWS red INT captions.

<u>NOTE</u>: If the master warning system (red) is not

cancelled the single-stroke gong tone is repeated at approximately 8 s intervals.

(b) At the flying controls servo controls hydraulic selection panel (Ref. 27-34-00) set the upper switch to "NORMAL".

(c) At the flying controls relay jacks panel (Ref. 27-34-00) set the selector switch to "NORM".

(d) At the ground hydraulics check-out panel (Ref. 29-23-00) set -

d1) the hydraulic selector to "YELLOW-YELLOW",

d2) the hydraulic pump switch PUMP 1 G-Y to "ON", and

d3) after a short delay the hydraulic pump switch PUMP 2 B-Y to "ON" (both pumps must not be switched on simultaneously).

(e) At the ACP set -

e1) the four lane select switches to "A",

e2) the four hydraulic select switches to "YELLOW" and

e3) confirm that the ramp and spill door indicators display 0 per cent.

(f) Using the RAMP RAISE - LOWER inching switches, lower each ramp, in turn, approximately 20 per cent and then return it to the fully-up position (0 per cent).

(g) Using the SPILL SHUT - OPEN inching switches, open each spill door, in turn, approximately 20 per cent, wait for 3 s and check that during this time the spill door does not move and then return it to the fully closed position (0 per cent).

(h) At the ground hydraulic check-out panel set the hydraulic selector to "GREEN-BLUE".

(i) At the ACP set the four hydraulic select switches to "AUTO".

(j) Repeat operations (f) and (g).

(k) Set the four RAMP - SPILL MASTER switches to "AUTO". Check that -

k1) the alpha, INT, LANE and HYD failure captions, the lane B lane-in-use lamps and the N1 reduce lamps on the N1 indicators are extinguished, and

k2) the lane A lane-in-use lamps and the N1 SIG fail captions are illuminated, accompanied by the amber INT master warnings.

(l) Set the four RAMP - SPILL MASTER switches to "MAN".

(m) Press-to-cancel the MWS red INT captions.

(n) Press-to-test the N1 SIG, LANE and HYD failure captions on the ACP, in turn. Check that each caption is illuminated and the MWS amber INT caption is illuminated, accompanied by the sounding of a single-stroke gong.

(p) Press-to-test the alpha fail caption on the ACP. Check that the caption is illuminated and the four MWS amber INT captions are illuminated, accompanied by the sounding of a single-stroke gong.

(q) At the ground hydraulics check-out panel, select "YELLOW-YELLOW".

(r) Trip the following circuit breaker and fit a safety clip.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
PFC IND	1-213	C287	N18

After SB 27-043 For A/C 001-007,

(r) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
YELL L/L (PFC & RELAY JACK 'A' SYS CONT)	1-213	C288	P18
YELL L/L (PFC & RELAY JACK 'B' SYS CONT)	3-213	C282	A8

(s) At the flying controls servo controls hydraulic selection panel (Ref.27-34-00) -

s1) set the upper switch to "BLUE ONLY",

s2) press-to-cancel the MWS PFC, FEEL and HYD captions, and

s3) check that the two blue solenoid selector lamps are lit.

After SB 27-043 For A/C 001-007,

(s) At the flying controls servo controls hydraulic selection panel (Ref. 27-34-00) -

s1) set the upper switch to "BLUE ONLY",

s2) check that the GREEN L.PRESS caption is illuminated,

s3) press-to-cancel the MWS PFC, FEEL and HYD captions, and

s4) check that the two blue solenoid selector lamps are lit.

(t) At the flying controls relay jacks panel set the selector switch to "BLUE ONLY".

(u) At the ground hydraulics check-out panel, set the hydraulics selector to "GREEN-YELLOW".

(v) Set the four lane select switches to "AUTO A".

(w) At the ram air turbine (RAT) test panel (Ref. 29-24-00) set the AICS GROUND - FLIGHT switch for No.1 intake to "GROUND" and check that the MWS red INT caption for each intake is illuminated, accompanied by a single-stroke gong. Return the switch to the "FLIGHT" position and check that the MWS red INT captions are extinguished.

(x) Repeat operation (w) as applied to the No.1 intake AICS GROUND - FLIGHT switch for Nos. 2, 3 and 4 intakes, in turn.

(y) At the AITP set the intake test ON - OFF switch to "ON" and check that the ON caption and the MWS red INT caption for each intake are illuminated, accompanied by a single-stroke gong. Return the switch to "OFF" and check that the ON caption and the MWS red captions are extinguished.

(z) Set the AICS GROUND - FLIGHT switches to "GROUND" and the AITP intake test ON - OFF switch to "ON". Check that the HOLD caption is illuminated after a delay of approximately 7 s.

NOTE: A random light pattern will occur on the ACP and AITP until the test program is commenced by use of the CONTINUE - OFF switch.

(aa) Press-to-cancel the MWS red INT captions.

(ab) Set the RAMP - SPILL MASTER switches for intakes 1 and 2 to "AUTO".

(ac) Set the CONTINUE - OFF switch on the AITP to "CONTINUE". Check that the CHK HYD caption is illuminated.

(ad) Start the test program by setting the CONTINUE - OFF switch on the AITP to "CONTINUE":

ad1) Verify the correct operation of the failure captions on the ACP by observing that each

caption is illuminated at least once during the test program.

NOTE: Operation of the associated master warnings by the failure captions has been previously checked in operations (n) and (p).

ad2) Check that the HOLD caption is extinguished and remains extinguished, and that after approximately 5 min the B/Y REQD caption is illuminated.

NOTE: Illumination of the B/Y REQD caption, provided that the HOLD caption has not been re-illuminated during the test program, indicates the successful
R completion of the preliminary test on intakes 1 and 2. The GO caption can be illuminated only on the successful completion of the N1 probe checks, which require all engines to be running (Ref. para.D.).

Illumination of the HOLD caption during the test, accompanied by the appropriate equipment failure caption and a binary address display, indicates that a failure has been detected and that the test sequence has stopped. Refer to Table 502 as applied to intakes 1 and 2 for the binary pattern number and the expected result for each pattern. The pattern number is determined by adding together the illuminated numbers on the AITP binary address. The test sequence can be continued by resetting
R the CONTINUE - OFF switch to "CONTINUE".

The RESET switch on the AITP allows the test program to be reset to the beginning at any time during the test sequence.

(ae) At the ground hydraulics check-out panel
R change the hydraulic supplies from "GREEN-
R YELLOW" to "YELLOW-YELLOW".

(af) At the flying controls servo controls hyd-

raulic selection panel -

R af1) Set the upper switch to "GREEN ONLY",

R af2) press-to-cancel the MWS PFC, FEEL
R and HYD captions, and

R af3) check that the two green solenoid
R selector lamps are lit.

After SB 27-043 For A/C 001-007,

(af) At the flying controls servo controls hydraulic selection panel -

af1) set the upper switch to "GREEN ONLY",

af2) check that the BLUE L.PRESS caption is illuminated,

af3) press-to-cancel the MWS PFC, FEEL and HYD captions, and

af4) check that the two green solenoid selector lamps are lit.

(ag) At the flying controls relay jacks panel set the selector switch to "GREEN ONLY".

(ah) At the ground hydraulics check-out panel set the hydraulic selector to "BLUE-YELLOW". Allow at least 1 min to elapse, to allow the green hydraulic system to depressurize, before proceeding with the test.

(aj) Set Nos.3 and 4 intakes RAMP - SPILL MASTER switches to "AUTO" and Nos.1 and 2 intakes RAMP - SPILL MASTER switches to "MAN". Check that Nos.1 and 2 INT failure captions are illuminated, accompanied by the MWS red captions; press-to-cancel the MWS red INT captions.

(ak) Start the test program by setting the CONTINUE - OFF switch on the AITP to "CONTINUE":

ak1) Verify the correct operation of the failure captions on the ACP by observing that each caption is illuminated at least once during the test program.

NOTE: Operation of the associated master warnings by the failure captions has been previously checked in operations (n) and (p).

ak2) Check that the HOLD caption is extinguished and remains extinguished, and that after approximately 5 min the N1 REQD caption is illuminated.

NOTE: Illumination of the N1 REQD caption, provided that the HOLD caption has not been re-illuminated during the test program, indicates the successful
R completion of the preliminary test on all four intakes. The GO caption can be illuminated only on the successful completion of the N1 probe checks, which require all engines to be running (Ref. para.D.).

Illumination of the HOLD caption during the test, accompanied by the appropriate equipment failure caption and a binary address display, indicates that a failure has been detected and that the test sequence has stopped. Refer to Table 502 as applied to intakes 3 and 4 for the binary pattern and the expected result for each pattern. The pattern number is determined by adding together the illuminated numbers on the AITP binary address. The test sequence can be continued by resetting the CONTINUE
R - OFF switch to "CONTINUE".

The RESET switch on the AITP allows the test program to be reset to the beginning at any time during the test sequence.

(al) Check that the pointers on all four pressure ratio error indicators are at the twelve o'clock position.

(3) Conclusion

(a) Set the intake test ON - OFF switch to "OFF"; close and wire-lock the switch guard in accordance with 20-21-13. Check that the ON caption is extinguished.

(b) Set the RAMP - SPILL MASTER switches for intakes 1 and 2 to "AUTO".

(c) Set the AICS GROUND - FLIGHT switches to "FLIGHT" and position the switch guards to
R maintain the switches at the "FLIGHT" position.

(d) Press the MWS RECALL push-switch and check that the MWS red INT captions remain extinguished.

(e) Set Nos.1, 2, 3 and 4 intakes RAMP - SPILL MASTER switches to "MAN". Press-to-cancel the red MWS INT failure captions.

(f) Set the RESET - OFF switch on the AITP to "RESET" and release it. Check that all captions on the AITP are extinguished.

(g) At the ground hydraulics check-out panel set the hydraulic pump switches PUMP 1 G-Y and PUMP 2 B-Y to "OFF".

R (h) At the flying controls servo controls
R hydraulic selection panel, set the upper
R switch to "NORMAL".

R (i) At the flying controls relay jacks panel, set
R the selector switch to "NORM".

R (j) Remove the safety clip and close the follow-
R ing circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
PFC IND	1-213	C287	N18

After SB 27-043 For A/C 001-007,

R (j) Remove the safety clips and close the following circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
YELL L/L (PFC & RELAY JACK 'A' SYS CONT)	1-213	C288	P18
YELL L/L (PFC & RELAY JACK 'B' SYS CONT)	3-213	C282	A8

R (k) Switch off and disconnnect electrical ground power as detailed in 24-41-00.

R (l) Remove all barriers and warning placards.

R D. Test - In conjunction with Two Aircraft Ground Hydraulic Check-out Pumps with Delayed Engine Start.

R (1) Prepare

R (a) Observe the safety precautions (Ref. 71-00-00, Adjustment/Test).

R (b) Ensure that a Preliminary Test has been carried out.

R (c) Make available electrical ground power as detailed in 24-41-00.

R (d) Ensure that for the duration of the test -

R d1) the equipment racking air extraction system (Ref. 21-21-00) is operating, and

R d2) The four intakes and the areas below the spill doors remain clear of persons and equipment.

R (e) Check that the master warning system (MWS) (Ref. 33-15-00) and the associated warning system (AWS) (Ref. 31-23-00) are operating.

R (f) Ensure that the MWS red and amber INT captions are extinguished; cancel them, if necessary.

(2) Test

(a) Set the RAMP SPILL MASTER switches to "MAN"; press-to-cancel the MWS red INT captions.

NOTE : If the master warning system (red) is not cancelled the single-stroke gong tone is repeated at approximately 8 s intervals.

(b) At the flying controls servo controls hyd-draulic selection panel (Ref. 27-34-00), set the upper switch to "NORMAL".

(c) At the flying controls relay jacks panel (Ref. 27-34-00), set the selector switch to "NORM".

(d) Trip the following circuit breaker and fit a safety clip.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
PFC IND	1-213	C287	N18

(e) At the flying controls servo controls hydra-ulic selection panel (Ref. 27-34-00) -

e1) set the upper switch to "BLUE ONLY".

e2) press-to-cancel the MWS PFC, FEEL and HYD captions, and

e3) check that the blue solenoid selector lamps are lit.

After SB 27-043 For A/C 001-007,

(d) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
YELL L/L (PFC & RELAY JACK 'A' SYS CONT)	1-213	C288	P18
YELL L/L (PFC & RELAY JACK 'B' SYS CONT)	3-213	C282	A8

After SB 27-043 For A/C 001-007,

(e) At the flying controls servo controls hydraulic selection panel (Ref. 27-34-00) -

e1) set the upper switch to "BLUE ONLY",

e2) check that the GREEN L.PRESS caption is illuminated,

e3) press-to-cancel the MWS PFC, FEEL and HYD captions, and

e4) check that the two blue solenoid selector lamps are lit.

(f) At the flying controls relay jacks panel set the selector switch to "BLUE ONLY".

(g) At the ground hydraulics check-out panel, set -

g1) the hydraulics selector to "GREEN-YELLOW",

g2) the hydraulic pump switch PUMP 1G-Y to "ON", and

g3) after a short delay, the hydraulic pump switch PUMP 2 B-Y to "ON" (both pumps must not be switched on simultaneously).

(h) Confirm that the ramp and spill door indicators display 0 per cent.

(i) At the ACP, set the four hydraulic select switches to "AUTO".

R (j) Set the four lane switches to "AUTO A".

R (k) At the ram air turbine (RAT) test panel (Ref. 29-24-00), set the AICS GROUND-FLIGHT switches to "GROUND". Check that the MWS red INT caption for each intake is illuminated, accompanied by a single-stroke gong.

R (l) At the AITP, set the intake test ON-OFF switch to "ON". Check that the HOLD caption is illuminated after a delay of approximately 7s.

R NOTE : A random light pattern will occur on the ACP and AITP until the test program is commenced by the use of the CONTINUE-OFF switch.

R (m) Press-to-cancel the MWS red INT captions.

R (n) Set the RAMP-SPILL MASTER switches for intakes 1 and 2 to "AUTO".

R (o) Set the CONTINUE-OFF switch on the AITP to "CONTINUE". Check that the CHK HYD caption is illuminated.

R (p) Start the test program by setting the CONTINUE-OFF switch on the AITP to "CONTINUE". Check that the HOLD caption is extinguished and remains extinguished, and that after approximately 5 min the B/Y REQD caption is illuminated.

R NOTE : Illumination of the B/Y REQD caption, provided that the HOLD caption has not been re-illuminated during the test program, indicates the succesful completion of the preliminary test on intakes 1 and 2. The GO caption can be illuminated only on the successful completion of the N1 probe checks, which require all engines to be running.

R Illumination of the HOLD caption during the test, accompanied by the appropriate equipment failure caption and a binary address display, indicates that a failure has been detected and that the test sequence has stopped (Ref. 71-00-39, Trouble Shooting). The test sequence can be continued by resetting the CONTINUE-OFF switch to "CONTINUE".

R The RESET switch on the AITP allows the
R test program to be reset to the beginning
R at any time during the test sequence.

R (q) At the ground hydraulics check-out panel, change
R hydraulic supplies from "GREEN-YELLOW" to
R "YELLOW-YELLOW".

R (r) At the flying controls servo controls hydraulic
R selection panel -

R r1) set the upper switch to "GREEN ONLY",

R r2) press-to-cancel the MWS PFC, FEEL and HYD
R captions, and

R r3) check that the two green solenoid selector
R lamps are lit.

After SB 27-043 For A/C 001-007,

R (r) At the flying controls servo controls hydraulic
R selection panel -

R r1) set the upper switch to "GREEN ONLY",

R r2) check that the BLUE L.PRESS caption is
R illuminated,

R r3) press-to-cancel the MWS PFC, FEEL and HYD
R captions, and

R r4) check that the two green solenoid selector
R lamps are lit.

R (s) At the flying controls relay jacks panel, set
R the selector switch to "GREEN ONLY".

R (t) At the ground hydraulics check-out panel, set the
R hydraulic selector to "BLUE-YELLOW". Allow 1
R min to elapse to permit the green hydraulic
R system to de-pressurize before proceeding with
R the test.

R (u) Set Nos.3 and 4 intake RAMP-SPILL MASTER
R switches to "AUTO" and Nos.1 and 2 intakes
R RAMP-SPILL MASTER switches to "MAN". Check that
R Nos.1 and 2 INT failure captions are illuminated

accompanied by the MWS red captions; press-to-cancel the MWS red INT captions.

(v) Start the test program by setting the CONTINUE-OFF switch on the AITP to "CONTINUE". Check that the HOLD caption is extinguished and remains extinguished, and that after approximately 5 min the N1 REQD caption is illuminated.

<u>NOTE</u> : Illumination of the N1 REQD caption, provided that the HOLD caption has not been re-illuminated during the test program, indicates the successful completion of the preliminary test on all four intakes. The GO caption can be illuminated only on the successful completion of the N1 probe checks, which require all engines to be running.

Illumination of the HOLD caption during the test, accompanied by the appropriate equipment failure caption and a binary address display, indicates that a failure has been detected and that the test sequence has stopped (Ref. 71-00-39, Trouble Shooting). The test sequence can be continued by resetting the CONTINUE-OFF switch to "CONTINUE".

The RESET switch on the AITP allows the test program to be reset to the beginning at any at any time during the test sequence.

(w) At the Electrical Generation Control Panel, set the generator control switch to "OFF" for all four engines.

(x) Set Nos.3 and 4 intakes RAMP-SPILL MASTER switches to "MAN". Check that Nos.3 and 4 INT failure captions are illuminated, accompanied by the MWS red captions; press-to-cancel the MWS red INT captions.

(y) Start and run all 4 engines at idle power, (Ref. 71-00-00, Adjustment/Test).

(z) At the ground hydraulics check-out panel -

z1) set the two hydraulic pump switches to "OFF", and,

R z2) trip the two pump circuit breakers.

R (aa) At the ACP -

R aa1)set the four intake RAMP-SPILL MASTER
R switches to "AUTO",

R aa2)check that all failure captions are ext-
R inguished and that the four green Lane A
R lane-in-use lights are illuminated. If
not reselect the lane selector switch or
R the hydraulic selector switch as appropriate.

R (ab) At the AITP, set the CONTINUE-OFF switch to
R "CONTINUE". Check that the HOLD caption is
R extinguished and remains extinguished, then,
R after approximately 30s the GO caption is
R illuminated.

R NOTE : Illumination of the GO caption indicates
R the successful completion of the test.

R Illumination of the HOLD caption during
R the test, accompanied by the appropriate
R equipment failure caption and a binary
R pattern address display, indicates that
R a failure has been detected and that the
R test sequence has stopped. Table 502
R lists the binary pattern numbers and
R defines the expected result for each
R pattern. The pattern number is determ-
R ined by adding together the illuminated
R numbers on the AITP binary address. The
R test sequence can be continued by setting
R the CONTINUE - OFF switch to "CONTINUE";
R this action causes the FAIL caption to be
R illuminated at the completion of the test.
R After rectification action has been taken,
R the test must be re-run to produce a GO
R condition.

R The RESET switch on the AITP allows the
R test program to be reset to the beginning
R at any time during the test sequence.

R (3) Conclusion

R (a) Shut down all four engines (Ref. 71-00-00,
R Adjustment/Test).

R (b) Set the intake test ON-OFF switch to "OFF";

close and wire-lock the switch guard in accordance with 20-21-13. Check that the ON caption is extinguished.

(c) Set the AICS GROUND-FLIGHT switches to "FLIGHT" and position the switch guards to maintain the switches at the "FLIGHT" position.

(d) Press the MWS RECALL push-switch and check that the MWS red INT captions remain extinguished.

(e) Set the RAMP-SPILL MASTER switches to "MAN"; press-to-cancel the MWS red INT captions.

(f) Set the RESET-OFF switch on the AITP to "RESET" and release it. Check that all captions on the AITP are extinguished.

(g) At the flying controls servo controls hydraulic selector panel (Ref. 27-34-00), set the upper switch to "NORMAL".

(h) At the flying controls relay jack panel, set the selector switch to "NORM".

(i) Remove safety clip and reset the following circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
PFC IND	1-213	C287	N18

After SB 27-043 For A/C 001-007,

(i) Remove safety clips and reset the following circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
YELL L/L (PFC & RELAY JACK 'A'	1-213	C288	P18

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
SYS CONT)			
YELL L/L (PFC & RELAY JACK 'B' SYS CONT)	3-213	C282	A8

(j) Switch off and disconnect electrical ground power (Ref. 24-41-00).

4. Operational Test - Ramps Manual Inching

A. Prepare

(1) Make available electrical ground power as detailed in 24-41-00.

(2) Ensure that the four intakes and the areas below the spill doors are clear of persons and equipment.

(3) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes.

(4) Display placards, warning of ramp and spill door operation, in the ramp and spill door areas.

(5) Pressurize the main (GREEN and BLUE) and standby (YELLOW) hydraulic systems (Ref.29-00-00); ensure that the hydraulic operating pressures are normal.

(6) At the auto control panel (ACP) select the GREEN hydraulic system for intakes 1 and 2 and the BLUE hydraulic system for intakes 3 and 4.

B. Test

(1) Set the four RAMP - SPILL MASTER switches to "MAN". Check that -

(a) all four INT failure warning captions are illuminated, and

(b) the master warning system is activated.

(2) Press-to-cancel the MWS red INT captions (Ref. 33-15-00). Check that all other failure captions and the lane-in-use lamps are extinguished.

(3) Set No.1 intake RAMP inching switch to "RAISE" and check that the No.1 RAMP position indicator (Ref. 71-63-14) displays 0 per cent.

(4) Set No.1 intake RAMP inching switch to "LOWER". Check that -

(a) the ramp travels smoothly,

(b) the travel time, including snubbing, is between 4.9 and 5.4 s, and

(c) the RAMP position indicator displays 100 per cent.

NOTE: Snubbing is recognized by the sudden reduction in the rate of ramp movement as the actuator nears its end-of-stroke position.

(5) Set No.1 intake RAMP inching switch to "RAISE". Check that -

(a) the ramp travels smoothly,

(b) the travel time, including snubbing, is between 7.5 and 8.9 s, and

(c) the RAMP position indicator displays 0 per cent.

(6) Repeat operations (3), (4) and (5) as applied to intakes 2, 3 and 4.

(7) Set the four hydraulic select switches to "YELLOW".

(8) Repeat operations (3), (4), (5) and (6).

C. Conclusion

(1) Depressurize the GREEN, BLUE and YELLOW hydraulic systems (Ref.29-00-00), and set the hydraulic select switches to "AUTO".

(2) Remove all barriers and warning placards.

(3) Switch off and disconnect electrical ground power as detailed in 24-41-00.

5. Operational Test - Spill Doors Manual Inching

A. Prepare

(1) Make available electrical ground power as detailed in 24-41-00.

(2) Ensure that the four intakes and the areas below the spill doors are clear of persons and equipment.

(3) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes.

(4) Display placards, warning of ramp and spill door operation, in the ramp and spill door areas.

(5) Pressurize the main (GREEN and BLUE) and standby (YELLOW) hydraulic systems (Ref.29-00-00); ensure that the hydraulic operating pressures are normal.

(6) At the auto control panel (ACP) select the GREEN hydraulic system for intakes 1 and 2, and the BLUE hydraulic system for intakes 3 and 4.

B. Test

(1) Set the four RAMP - SPILL MASTER switches to "MAN". Check that -

(a) all four INT failure warning captions are illuminated, and

(b) the master warning system is activated.

(2) Press-to-cancel the MWS red INT captions (Ref. 33-15-00). Check that all other failure captions and the lane-in-use lamps are extinguished.

(3) Set No.1 intake SPILL inching switch to "SHUT" and check that the No.1 SPILL door position indicator (Ref. 71-64-16) displays 0 per cent.

(4) Set No.1 intake SPILL inching switch to "OPEN". Check that -

(b) the travel time is between 7.3 and 8.2 s and

(c) the SPILL door position indicator displays 100 per cent.

(5) Set No.1 intake SPILL inching switch to "SHUT". Check that -

(a) the spill door travels smoothly,

(b) the travel time is between 10.2 and 11.8 s and

(c) the SPILL door position indicator displays 0 per cent.

(6) Repeat operations (3), (4) and (5) as applied to intakes 2, 3 and 4.

(7) Set the four hydraulic select switches to "YELLOW".

(8) Repeat operations (3), (4), (5) and (6).

C. Conclusion

(1) Depressurize the GREEN, BLUE and YELLOW hydraulic systems (Ref.29-00-00), and set the hydraulic switches to "AUTO".

(2) Remove all barriers and warning placards.

(3) Switch off and disconnect electrical ground power as detailed in 24-41-00.

6. Operational Test - Auxiliary Inlets

A. Prepare

(1) Make available electrical ground power as detailed in 24-41-00.

(2) Ensure that all four spill doors are less than 10 per cent open.

(3) Ensure that the spill doors are not operated during the following tests and place placards prohibiting spill door operation on the AICS management panels.

B. Test

(1) Manually, press each auxiliary inlet closed. Check

that each AUX INLET magnetic indicator on the auto control panel displays SHUT.

(2) Manually, slowly partially open each auxiliary inlet, in turn. Check that each AUX INLET magnetic indicator displays diagonal stripes.

(3) Fully open each auxiliary inlet, in turn. Check that each AUX INLET magnetic indicator displays OPEN.

(4) Slowly return each auxiliary inlet to the fully closed position, in turn. Check that each magnetic indicator display first changes to diagonal stripes and then changes to SHUT when the inlet is fully closed.

C. Conclusion

(1) Remove the warning placards.

(2) Switch off and disconnect electrical ground power as detailed in 24-41-00.

7. Functional Test

NOTE: Two separate manual checking procedures for carrying out a preliminary test of the system are detailed; the first uses ground hydraulic supplies (Ref. para.B.), the second, the aircraft ground hydraulics check out pumps (Ref. para.C.).

The tests are alternative methods of testing the AICS system using the air intake system test set (AISTS) prior to the tests which require the engines to be running (Ref. para.D.).

A. Equipment and Materials

DESCRIPTION	PART NO.
Air intake system test set	TE 6048

B. Preliminary Test - Using Air Intake System Test Set (AISTS) in Conjunction With Three Hydraulic Ground Rigs (Ref. Fig. 501)

(1) Prepare

(a) Ensure that for the duration of the test -

a1) the equipment racking air extraction system (Ref. 21-21-00) is operating, and

a2) the four intakes and the areas below the spill doors remain clear of persons and equipment.

(b) Display placards, warning of AICS test in progress, and position barriers to prevent persons from inadvertently entering the area in the vicinity of the ramps and spill doors.

(c) Make available electrical ground power as detailed in 24-41-00.

(d) Check that the master warning system (MWS) (Ref. 33-15-00) and the associated audio warning system (AWS) (Ref. 31-23-00) are operating.

(e) Ensure that the MWS red and amber INT captions are extinguished; cancel them if necessary by pressing the face of each caption.

(f) Make available hydraulic ground power to the main hydraulic systems (GREEN and BLUE) and to the standby hydraulic system (YELLOW) (Ref. 29-00-00); ensure that the hydraulic operating pressures are normal.

(g) Test the filaments (Ref. 33-14-00) on the ACP, the air intake test panel (AITP) and the auto N1 reduce lamp on the N1 indicators (Ref. 71-00-00).

(h) Set the RAMP - SPILL MASTER switches to "MAN". Check that the INT fail captions on the auto control panel (ACP) and the MWS red INT captions are illuminated, accompanied by the single-stroke gong; press-to-cancel the MWS red INT captions.

NOTE: If the MWS red INT captions are not cancelled, the single-stroke gong is repeated at approximately 8 s intervals.

(i) At the ACP set -

i1) the four lane select switches to "A",

i2) the four hydraulic select switches to

"YELLOW" and

i3) confirm that the ramp and spill door position indicators display 0 per cent.

(j) Using the RAMP RAISE - LOWER inching switches, lower each ramp approximately 20 per cent and then return it to the fully-up position (0 per cent).

(k) Using the SPILL SHUT - OPEN inching switches, open each spill door approximately 20 per cent, wait for 3 s and check that during this time the spill door does not move and then return it to the fully closed position (0 per cent).

(l) Set the four hydraulic select switches to "AUTO".

(m) Repeat operations (j) and (k).

(n) Set the four RAMP - SPILL MASTER switches to "AUTO". Check that -

n1) the alpha, INT, LANE and HYD failure captions, the lane B lane-in-use lamps and the N1 reduce lamps on the N1 indicators are extinguished, and

n2) the lane A lane-in-use lamps and the N1 SIG fail captions are illuminated, accompanied by the MWS amber INT captions.

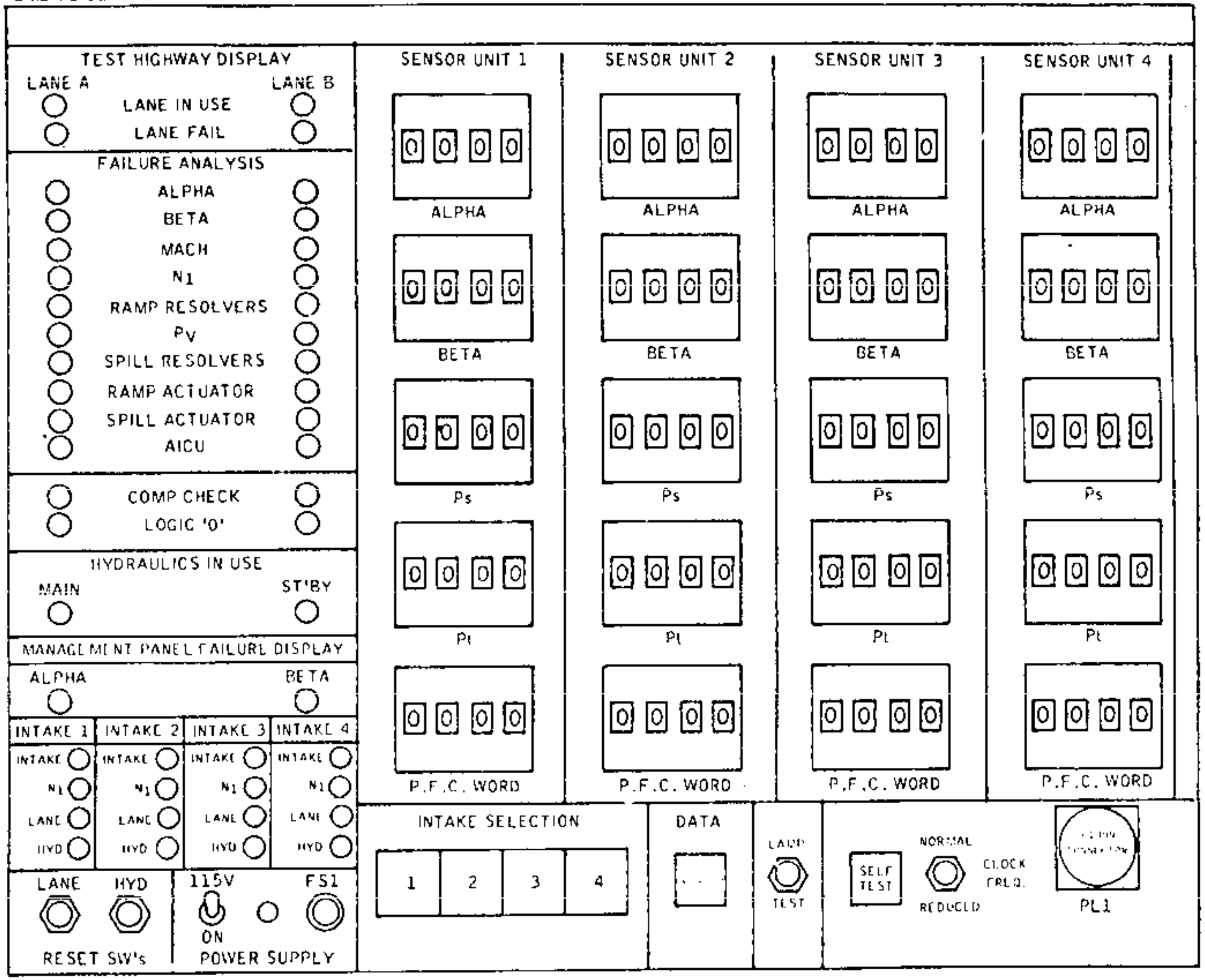
(o) Set the four RAMP - SPILL MASTER switches to "MAN".

(p) Press-to-cancel the MWS red INT captions.

(q) Press-to-test the N1 SIG, LANE and HYD failure captions on the ACP, in turn. Check that each caption is illuminated and the associated MWS amber INT caption is illuminated, accompanied by the sounding of a single-stroke gong.

(r) Press-to-test the alpha fail caption on the ACP. Check that the caption is illuminated and the four MWS amber INT captions are illuminated, accompanied by the sounding of a single-stroke gong.

(s) Remove the air intake test unit (Ref. 71-61-18).



- Air Intake Test Set - Controls and Indicators
Figure 501

(t) Set the four lane select switches to "AUTO".

(u) Ensure that the POWER SUPPLY 115 V/ON switch on the air intake system test set (AISTS) is set to 'off'. (Ref. Fig. 501).

(v) Connect the AISTS to the air intake test unit connectors. Reset the circuit breakers tripped during the removal of the AITU and set the AISTS POWER SUPPLY switch to "ON". Check that the POWER SUPPLY lamp is illuminated.

(w) Press the LAMP TEST push-switch on the AISTS and check that all lamps are illuminated.

NOTE: The following procedure checks that the clock and address circuits of the test set are functioning, and the data output from any of the thumbwheel switches. The tests are written assuming SENSOR UNIT 1 ALPHA thumbwheel is to be checked, but sensor units 2, 3 and 4 outputs can be checked by pressing the appropriate INTAKE SELECTION button and adopting the same procedure.

During the self-test procedure the LANE A and LANE B TEST HIGHWAY DISPLAY on the test set should be identical.

(x) Set the INTAKE SELECTION selector to "1", the DATA INTERRUPT switch to 'off' and the SELF-TEST switch to 'on'.

(y) Set all (five) thumbwheel selectors for Sensor Unit 1 to read 4095.

(z) Check that all lamps in Column C in Table 503 are extinguished, except for the LANE FAIL and COMP. CHECK lamps.

(aa) Rotate the SENSOR UNIT 1 ALPHA thumbwheel selector to the positions shown in Table 503, Column A, in turn. Check that at each position the associated TEST HIGHWAY DISPLAY lamp is illuminated and caused to flash approximately twice per second, while the remaining lamps in Column C remain static.

THUMBWHEEL SETTINGS A	B	TEST HIGHWAY LAMPS C
4093	0002	LANE FAIL
4091	0004	COMP. CHECK
4087	0008	LANE IN USE
4079	0016	-
4063	0032	-
4031	0064	MACH
3967	0128	N1
3839	0256	RAMP RESOLVERS
3583	0512	Pv
3071	1024	SPILL RESOLVERS
2047	2048	RAMP ACTUATOR
	0384	N1 and RAMP RESOLVER
	0448	MACH, N1 and RAMP RESOLVER
	0768	RAMP RESOLVER and Pv

Air Intake System Test Set - Self-test Settings
Table 503

(ab) Set all the SENSOR UNIT 1 thumbwheels to 4095 and check that all lamps in Column C in Table 503 are illuminated, except for the LANE FAIL and COMP. CHECK lamps.

(ac) Check that when the SENSOR UNIT 1 ALPHA thumbwheels are set, in turn, to the readings shown in Table 503, Column B, the associated lamp flashes approximately twice per second while the remaining lamps

in Column C remain static.

(ad) Check that the SPILL ACTUATOR and HYDRAULICS IN USE lamps are flashing approximately twice per second, the AICU lamp is flashing approximately 4 times per second and the LOGIC 0 lamp is out.

(ae) Set the 'clock reduce' switch to 'on'.

(af) Set all SU1 thumbwheels to 0006.

(ag) Set the SENSOR UNIT 1 ALPHA thumbwheel to 0000 and check that each time the COMP. CHECK lamp is lit the address lamps shown in Table 504 are in the state indicated for ALPHA.

THUMBWHEEL UNDER TEST	ADDRESS LAMPS		
	SPILL ACTUATOR	AICU	HYD IN USE
ALPHA	ON	OFF	ON
BETA	OFF	ON	ON
Ps	ON	ON	ON
Pt	OFF	OFF	OFF
PFC WORD	ON	OFF	OFF

Air Intake System Test Set - Self-test Address Lamp Indications
Table 504

(ah) Reset the ALPHA thumbwheel switch to 0006 and carry out a similar test with the SU1 BETA, Ps, Pt and PFC WORD thumbwheels set to 0000, in turn, in conjunction with the appropriate address lamps shown on Table 504; after each test reset the tested thumbwheel to 0006.

(ai) Cancel the self-test and check that the SELF-TEST caption is extinguished.

(aj) At the ram air turbine test panel (Ref.29-24-00) set the AICS GROUND - FLIGHT switch for No.1 intake to "GROUND" and check that the MWS red caption for each intake is illuminated,

accompanied by a single-stroke gong. Return the switch to the "FLIGHT" position and check that the MWS red INT captions are extinguished.

(ak) Repeat operation (aj) as applied to the AICS GROUND - FLIGHT switches for Nos.2, 3 and 4 intakes, in turn.

(al) At the AITP set the intake test ON - OFF switch to "ON" and check that the ON caption and the MWS red INT caption for each intake are illuminated, accompanied by a single-stroke gong. Return the switch to "OFF" and check that the ON caption and the MWS red INT captions are extinguished.

(am) Set the AICS GROUND - FLIGHT switches to "GROUND" and the AITP intake test ON - OFF switch to "ON".

(an) Press-to-cancel the MWS red INT captions.

(ap) Set the four RAMP - SPILL MASTER switches to "AUTO".

(2) Test

(a) At the AISTS depress the INTERRUPT switch and set the ALPHA, BETA, Ps, Pt and PFC WORD thumbwheels for each SENSOR UNIT (SU) as shown on Chart 501. Release the INTERRUPT switch.

(b) Perform the tests detailed on Charts 502 to 599 and A501 to A521, in turn, using the procedures defined below:

b1) Depress the INTERRUPT switch whenever adjustments to the thumbwheel settings are being made, then release the INTERRUPT switch to continue the test.

NOTE: Thumbwheel settings which differ from those shown on the previous Chart are underlined thus, 2656, and only these thumbwheels require to be reset.

b2) When LANE and HYD RESET is requested on a Chart by the word PRESS appearing in the adjacent box,

set the thumbwheels to the indicated position,

allow at least 1 s to elapse after setting the thumbwheels, then hold the HYD RESET switch depressed for 1 s,

allow at least 1 s to elapse after pressing the HYD RESET switch, then hold the LANE RESET switch depressed for 1 s,

ensure that the MATCH captions on the appropriate chart match the lamps illuminated on the AISTS TEST HIGHWAY DISPLAY, for each intake, by pressing the INTAKE SELECTION captions 1, 2, 3 and 4, in turn, and

ensure that the MANAGEMENT PANEL captions on the appropriate chart match the lamps illuminated on the AISTS MANAGEMENT PANEL FAILURE DISPLAY.

NOTE: The test sequence may be restarted at any of the Charts which include HYD and LANE RESETS.

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	0608	0608	0608	0608

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 501

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD
PRESS	PRESS

CHART 502

CMB7161005ACM0

Charts 501 and 502

Charts 501 and 502

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*	*	*	*	*	*	*	*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL	*	*	*	*	*	*	*	*
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL	*	*	*	*	*	*	*	*
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	0992	0992	0992	0992

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1	*	*	*	*
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 503

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*	*	*	*	*	*	*	*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL	*	*	*	*	*	*	*	*
RAMP RES. FAIL	*	*	*	*	*	*	*	*
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1001	1001	1001	1001

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1	*	*	*	*
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 504

CMB7161005AFM0

Charts 503 and 504

Charts 503 and 504

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

CHART 505

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*	*	*	*	*	*	*	*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL	*	*	*	*	*	*	*	*
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL	*	*	*	*	*	*	*	*
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1022	1022	1022	1022

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1	*	*	*	*
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 505

CHART 506

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1	*	*	*	*
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 506

CMB7161005AMMO

Charts 505 and 506

Charts 505 and 506

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*	*	*	*	*	*	*	*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL	*	*	*	*	*	*	*	*
RAMP RES. FAIL								
Pv FAIL	*	*	*	*	*	*	*	*
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL	*	*	*	*	*	*	*	*
COMP. CHECK	*	*	*	*	*	*	*	*
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1600	1600	1600	1600

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1	*	*	*	*
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 507

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*	*	*	*	*	*	*	*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL	*	*	*	*	*	*	*	*
RAMP RES. FAIL								
Pv FAIL	*	*	*	*	*	*	*	*
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL	*	*	*	*	*	*	*	*
COMP. CHECK	*	*	*	*	*	*	*	*
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1568	1568	1568	1568

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1	*	*	*	*
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 508

CMB7161005AUMO

Charts 507 and 508

Charts 507 and 508

[*] CAPTION ILLUMINATED   [M][S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD
PRESS	PRESS

CHART 509

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL	*	*	*	*	*	*	*	*
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1659	1659	1659	1659

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 510

CMB7161005AZMO

Charts 509 and 510

Charts 509 and 510

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*	*	*	*	*	*	*	*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL	*	*	*	*	*	*	*	*
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1647	1647	1647	1647

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 511

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*	*	*	*	*	*	*	*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL	*	*	*	*	*	*	*	*
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1646	1646	1646	1646

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 512

CMB7161005BAMO

Charts 511 and 512

Charts 511 and 512

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*	*	*	*	*	*	*	*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL	*	*	*	*	*	*	*	*
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1641	1641	1641	1641

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 513

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*	*	*	*	*	*	*	*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL	*	*	*	*	*	*	*	*
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1662	1662	1662	1662

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 514

CMB7161005BFMO

Charts 513 and 514

Charts 513 and 514

[*] CAPTION ILLUMINATED [M][S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*	*	*	*	*	*	*	*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL	*	*	*	*	*	*	*	*
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1660	1660	1660	1660

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 515

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*	*	*	*	*	*	*	*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL	*	*	*	*	*	*	*	*
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1661	1661	1661	1661

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 516

CMB7161005BMMO

Charts 515 and 516

-

Charts 515 and 516

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD
PRESS	PRESS

CHART 517

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1645	1645	1645	1645

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 518

CMB7161005BUMO

Charts 517 and 518

Charts 517 and 518

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD
PRESS	PRESS

CHART 519

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1644	1644	1644	1644

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 520

CMB7161005BZM0

Charts 519 and 520

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Charts 519 and 520

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

CHART 521

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's	
LANE	HYD
PRESS	PRESS

CHART 521

CHART 522

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1656	1656	1656	1656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 522

CMB7161005CAMO

Charrs 521 and 522

Charts 521 and 522

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

CHART 523

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD
PRESS	PRESS

CHART 523

CHART 524

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1655	1655	1655	1655

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 524

CMB71610005CFM0

Charts 523 and 524

Charts 523 and 524

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's	
LANE	HYD
PRESS	PRESS

CHART 525

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	1669	1669	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's	
LANE	HYD

CHART 526

CMB71610005CMMO

Charts 525 and 526

Charts 525 and 526

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's	
LANE	HYD

CHART 527

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*	*		*		*	
LANE FAIL	*							*
ALPHA FAIL								
BETA FAIL								
MACH FAIL	*							*
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1364	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE	*			*
HYD				

RESET SW's	
LANE	HYD

CHART 528

CMB7161005CUM0

Charts 527 and 528

Charts 527 and 528

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1		INT 2		INT 3		INT 4	
	A	B	A	B	A	B	A	B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD					
RAMP RES. FAIL			CAPTION					
Pv FAIL			DISPLAY					
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD		
N1		CAPTION		
LANE		DISPLAY		
HYD				

RESET SW's	
LANE	HYD

CHART 529

MATCH	INT 1		INT 2		INT 3		INT 4	
	A	B	A	B	A	B	A	B
LANE-IN-USE		*		*	*		*	
LANE FAIL			*			*		
ALPHA FAIL								
BETA FAIL								
MACH FAIL			*			*		
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	1364	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE	*	*	*	
HYD				

RESET SW's	
LANE	HYD

CHART 530

CMB71610005CZMO

Charts 529 and 530

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Charts 529 and 530

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 531

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*				*	*	
LANE FAIL				*	*			
ALPHA FAIL								
BETA FAIL								
MACH FAIL				*	*			
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	1364	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		*		
N1				
LANE	*	*	*	
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 532

CMB7161005DAMO

Charts 531 and 532

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Charts 531 and 532

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

CHART 533

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 533

CHART 534

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE						*		*
LANE FAIL		*					*	
ALPHA FAIL								
BETA FAIL								
MACH FAIL		*					*	
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	1364
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*		
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 534

CMB7161005DFM0

Charts 533 and 534

\- Charts 533 and 534

[*] CAPTION ILLUMINATED [M][S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD					
RAMP RES. FAIL			CAPTION					
Pv FAIL			DISPLAY					
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD		
N1		CAPTION		
LANE		DISPLAY		
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 535

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*	*	*	*	*	*	*	*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL	*	*	*	*	*	*	*	*
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1647	1647	1647	1647

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 536

CMB7161005DMMO

Charts 535 and 536

Charts 535 and 536

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 537

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*							*
ALPHA FAIL								
BETA FAIL								
MACH FAIL	*							*
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	1364	1364	1364
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 538

CMB71610005DUMO

Charts 537 and 538

Charts 537 and 538

[*] CAPTION ILLUMINATED [M][S] HYD-IN-USE (MAIN OR STANDBY)

CHART 539

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1364	1364	1364	1364
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 539

CHART 540

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL			*			*		
ALPHA FAIL								
BETA FAIL								
MACH FAIL			*			*		
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1364	2560	1364	1364
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 540

CMB7161005D2M0

Charts 539 and 540

Charts 539 and 540

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1364	1364	1364	1364
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 541

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL				*	*			
ALPHA FAIL								
BETA FAIL								
MACH FAIL				*	*			
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1364	1364	2560	1364
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 542

CMB7161005EAM0

Charts 541 and 542

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Charts 541 and 542

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL			DISREGARD CAPTION DISPLAY					
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1364	1364	1364	1364
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 543

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL		*					*	
ALPHA FAIL								
BETA FAIL								
MACH FAIL		*					*	
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1364	1364	1364	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 544

CMB7161005EEFMO

Charts 543 and 544

Charts 543 and 544

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's	
LANE	HYD
PRESS	PRESS

CHART 545

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2912	2912	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's	
LANE	HYD

CHECK N1 REDUCE LAMPS:
1 and 2 Illuminated
3 and 4 Extinguished

CHART 546

CNB71610005EMMO

Charts 545 and 546

Charts 545 and 546

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL			DISREGARD CAPTION DISPLAY					
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 547

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2912	2912

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHECK N1 REDUCE LAMPS:
1 and 2 Extinguished
3 and 4 Illuminated

CHART 548

CMB71610005EUMO

Charts 547 and 548

Charts 547 and 548

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 549

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*		*		*		*
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL	*	*	*	*	*	*	*	*
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2016	2016	2016	2016

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1	*	*	*	*
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 550

CMB7161005E2MO

Chart 549 and 550

Charts 549 and 550

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE								

DISREGARD CAPTION DISPLAY

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

DISREGARD CAPTION DISPLAY

RESET SW's	
LANE	HYD

CHART 551

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*		*		*		*
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2912	2912	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1	*	*	*	*
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHECK N1 REDUCE LAMPS:
1 and 2 Extinguished
3 and 4 Illuminated

CHART 552

CMB71610O5FAMO

Charts 551 and 552

Charts 551 and 552

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 553

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*		*		*		*
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2912	2912

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1	*	*	*	*
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHECK N1 REDUCE LAMPS:
1 and 2 Illuminated
3 and 4 Extinguished

CHART 554

CMB7161005FFM0

Charts 553 and 554

Charts 553 and 554

[*] CAPTION ILLUMINATED [M][S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's	
LANE	HYD
PRESS	PRESS

CHART 555

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*		*	*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	S	*	S	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1642	1642	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE	*	*		
HYD	*	*		

RESET SW's	
LANE	HYD

CHART 556

CM87161005FMMO

Charts 555 and 556

Charts 555 and 556

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 557

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE						*		*
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	S	*	S	*	S	*	S

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	1642	1642

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*		
N1				
LANE	*	*	*	*
HYD	*	*	*	*

RESET SW's LANE	RESET SW's HYD

CHART 558

CMB7161005FUMO

Charts 557 and 558

Charts 557 and 558

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	S	*	S	*	S	*	S

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1642	1642	1642	1642

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD	*	*	*	*

RESET SW's LANE	RESET SW's HYD

CHART 559

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD
PRESS	PRESS

CHART 560

CMB71610005FZM0

Charts 559 and 560

Charts 559 and 560

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

CHART 561

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	S	*	S	*	S	*	S

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	1663	1663	1663	1663

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD	*	*	*	*

RESET SW's	
LANE	HYD

CHART 562

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's	
LANE	HYD
PRESS	PRESS

CMB7161005GAMO

Charts 561 and 562

Charts 561 and 562

[*] CAPTION ILLUMINATED   [M][S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	0096	0096	0096	0096

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 563

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD
PRESS	PRESS

CHART 564

CMB7161005GFM0

Charts 563 and 564

Charts 563 and 564

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	0352	0352	0352	0352

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 565

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD
PRESS	PRESS

CHART 566

CMB7161005GMMO

Charts 565 and 566

Charts 565 and 566

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL	*	*	*	*	*	*	*	*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL	*	*	*	*	*	*	*	*
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	0608	0608	0608	0608

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 567

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	0608	0608	0608	0608

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 568

CMB7161005GUMO

Charts 567 and 568

Charts 567 and 568

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1		INT 2		INT 3		INT 4	
	A	B	A	B	A	B	A	B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 569

MATCH	INT 1		INT 2		INT 3		INT 4	
	A	B	A	B	A	B	A	B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL	*							*
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	1669	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA	*			
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 570

CN8716T005GZMO

Charts 569 and 570

Charts 569 and 570

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's	
LANE	HYD

CHART 571

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL			*			*		
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	1669	2085	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA		*		
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 572

CMB7161005HAM0

Charts 571 and 572

Charts 571 and 572

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1		INT 2		INT 3		INT 4	
	A	B	A	B	A	B	A	B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

DISREGARD CAPTION DISPLAY

	SU 1	SU 2	SU 3	SU 4	
	2085	2085	2085	2085	ALPHA
	2048	2048	2048	2048	BETA
	1000	1000	1000	1000	Ps
	2587	2587	2587	2587	Pt
	2656	2656	2656	2656	PFC WORD

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

DISREGARD CAPTION DISPLAY

RESET SW's	
LANE	HYD

CHART 573

MATCH	INT 1		INT 2		INT 3		INT 4	
	A	B	A	B	A	B	A	B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL				*	*			
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4	
	2085	2085	1669	2085	ALPHA
	2048	2048	2048	2048	BETA
	1000	1000	1000	1000	Ps
	2587	2587	2587	2587	Pt
	2656	2656	2656	2656	PFC WORD

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA			*	
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 574

CMB7161005HFM0

Charts 573 and 574

Charts 573 and 574

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 575

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL		*					*	
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	1669
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA		*		
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 576

CMB71610005HMMO

Charts 575 and 576

Charts 575 and 576

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	1669	1669	1669	1669
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 577

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL	*							*
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	1669	1669	1669
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA			*	
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 578

CMB7161005HUMO

Charts 577 and 578

- Charts 577 and 578

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	1669	1669	1669	1669
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 579

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL			*			*		
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT.FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	1669	2085	1669	1669
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA		*		
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 580

CMB7161005HZMO

Charts 579 and 580

Charts 579 and 580

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	1669	1669	1669	1669
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 581

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL				*	*			
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	1669	1669	2085	1669
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA	*			
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 582

CMB71610005JAM0

Charts 581 and 582

Charts 581 and 582

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	1669	1669	1669	1669
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 583

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL		*					*	
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	1669	1669	1669	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA		*		
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 584

CMB7161005JFMO

Charts 583 and 584

Charts 583 and 584

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 585

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL	*	*	*	*	*	*	*	*
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	1669	1669	2085	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA	*			
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

RESET SW's	
LANE	HYD

CHART 586

CMB7161005JMMO

Charts 585 and 586

Charts 585 and 586

[*] CAPTION ILLUMINATED   [M][S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD
PRESS	

CHART 587

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	0864	0864	0864	0864

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART 588

CMB7161005JUMO

Charts 587 and 588

Charts 587 and 588

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL	*	*	*	*	*	*	*	*
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA		*		
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

	SU 1	SU 2	SU 3	SU 4
ALPHA	1669	1669	2085	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	0864	0864	0864	0864

RESET SW's LANE	RESET SW's HYD

CHART 589

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

	SU 1	SU 2	SU 3	SU 4
ALPHA	1669	1669	2085	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

RESET SW's LANE	RESET SW's HYD

CHART 590

CMB71610005JZM0

Charts 589 and 590

Charts 589 and 590

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1				
LANE	*	*	*	*
HYD				

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1000	1000	1000	1000
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

RESET SW's LANE	RESET SW's HYD

CHART 591

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE								

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	0608	0608	0608	0608

RESET SW's LANE	RESET SW's HYD

CHART 592

CM87161005KAMO

Charts 591 and 592

Charts 591 and 592

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's	
LANE	HYD
PRESS	

CHART 593

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*	*			*	*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	S	*	M	*	S	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	1642	2656	1642	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE	*		*	
HYD	*		*	

RESET SW's	
LANE	HYD

CHART 594

CM8716100SKFMO

Charts 593 and 594

Charts 593 and 594

Printed in England

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	S	*	M	*	S	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD	*		*	

RESET SW's LANE	RESET SW's HYD
PRESS	

CHART 595

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	S	*	M	*	S	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1800	1800	1800	1800
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD	*		*	

RESET SW's LANE	RESET SW's HYD

CHART 596

CMB7161005KMMO

Charts 595 and 596

Charts 595 and 596

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	S	*	M	*	S	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD	*		*	

RESET SW's	
LANE	HYD

CHART 597

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*		*		*		*
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL	*	*	*	*	*	*	*	*
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	S	*	M	*	S	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2016	2016	2016	2016

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1	*	*	*	*
LANE	*	*	*	*
HYD	*		*	

RESET SW's	
LANE	HYD

CHART 598

CMB71610005KUNO

Charts 597 and 598

Charts 597 and 598

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*		*		*		*
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	S	*	M	*	S	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1	*	*	*	*
LANE	*	*	*	*
HYD	*		*	

RESET SW's LANE	RESET SW's HYD

CHART 599

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*		*		*		*
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	S	*	M	*	S	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1800	1800	1800	1800
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1	*	*	*	*
LANE	*	*	*	*
HYD	*		*	

RESET SW's LANE	RESET SW's HYD

CHART A501

CMB7161005K2M0

Charts 599 and A501

Charts 599 and A501

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*		*		*		*
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	S	*	M	*	S	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1	*	*	*	*
LANE	*	*	*	*
HYD	*		*	

RESET SW's	
LANE	HYD

CHART A502

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*				*		
LANE FAIL	*			*	*			*
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL	*			*	*			*
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	S	*	M	*	S	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	1647	2656	1647	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		*		*
N1	*	*	*	*
LANE	*	*	*	*
HYD	*		*	

RESET SW's	
LANE	HYD

CHART A503

CMB7161005LAMO

Charts A502 and A503

Charts A502 and A503

[*] CAPTION ILLUMINATED   [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	1120	1120	1120	1120

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART A504

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	S	*	M	*	S	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1800	1800	1800	1800
Pt	2587	2587	2587	2587
PFC WORD	1120	1120	1120	1120

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*	*	*	*
N1	*	*	*	*
LANE	*	*	*	*
HYD	*		*	

RESET SW's LANE	RESET SW's HYD

CHART A505

CM8716100 5LFMO

Charts A504 and A505

Charts A504 and A505

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL			DISREGARD CAPTION DISPLAY					
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE								

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	1120	1120	1120	1120

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE		DISREGARD CAPTION DISPLAY		
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART A506

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD
PRESS	PRESS

CHART A507

CMB7161005LMMO

Charts A506 and A507

Charts A506 and A507

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1		INT 2		INT 3		INT 4	
	A	B	A	B	A	B	A	B
LANE-IN-USE	*			*	*			*
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	S	*	M	*	S

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2656	1642	2656	1642

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE		*		*
HYD		*		*

RESET SW's	
LANE	HYD

CHART A508

MATCH	INT 1		INT 2		INT 3		INT 4	
	A	B	A	B	A	B	A	B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	S	*	M	*	S

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD		*		*

RESET SW's	
LANE	HYD
PRESS	

CHART A509

CMB71610005LUMO

Charts A508 and A509

Charts A508 and A509

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	S	*	M	*	S

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1800	1800	1800	1800
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD		*		*

RESET SW's LANE	RESET SW's HYD

CHART A510

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	S	*	M	*	S

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD		*		*

RESET SW's LANE	RESET SW's HYD

CHART A511

CMB7161005LZMO

Charts A510 and A511

Charts A510 and A511

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*		*		*		*
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL	*	*	*	*	*	*	*	*
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	S	*	M	*	S

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2016	2016	2016	2016

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1	*	*	*	*
LANE	*	*	*	*
HYD		*		*

RESET SW's	
LANE	HYD

CHART A512

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*		*		*		*
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	S	*	M	*	S

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1	*	*	*	*
LANE	*	*	*	*
HYD		*		*

RESET SW's	
LANE	HYD

CHART A513

CMB7161005MAMO

Charts A512 and A513

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Charts A512 and A513

[*] CAPTION ILLUMINATED [M][S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*		*		*		*
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	S	*	M	*	S

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1800	1800	1800	1800
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1	*	*	*	*
LANE	*	*	*	*
HYD		*		*

RESET SW's LANE	RESET SW's HYD

CHART A514

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE		*		*		*		*
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	S	*	M	*	S

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1	*	*	*	*
LANE	*	*	*	*
HYD		*		*

RESET SW's LANE	RESET SW's HYD

CHART A515

CMB7161005MFMO

Charts A514 and A515

Charts A514 and A515

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE				*				*
LANE FAIL		*	*			*	*	
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL		*	*			*	*	
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE	*	M	*	S	*	M	*	S

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2656	1647	2656	1647

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE	*		*	
N1	*	*	*	*
LANE	*	*	*	*
HYD		*		*

RESET SW's LANE	RESET SW's HYD

CHART A516

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE								
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC 'O'								
HYD-IN-USE								

DISREGARD CAPTION DISPLAY

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	1120	1120	1120	1120

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

DISREGARD CAPTION DISPLAY

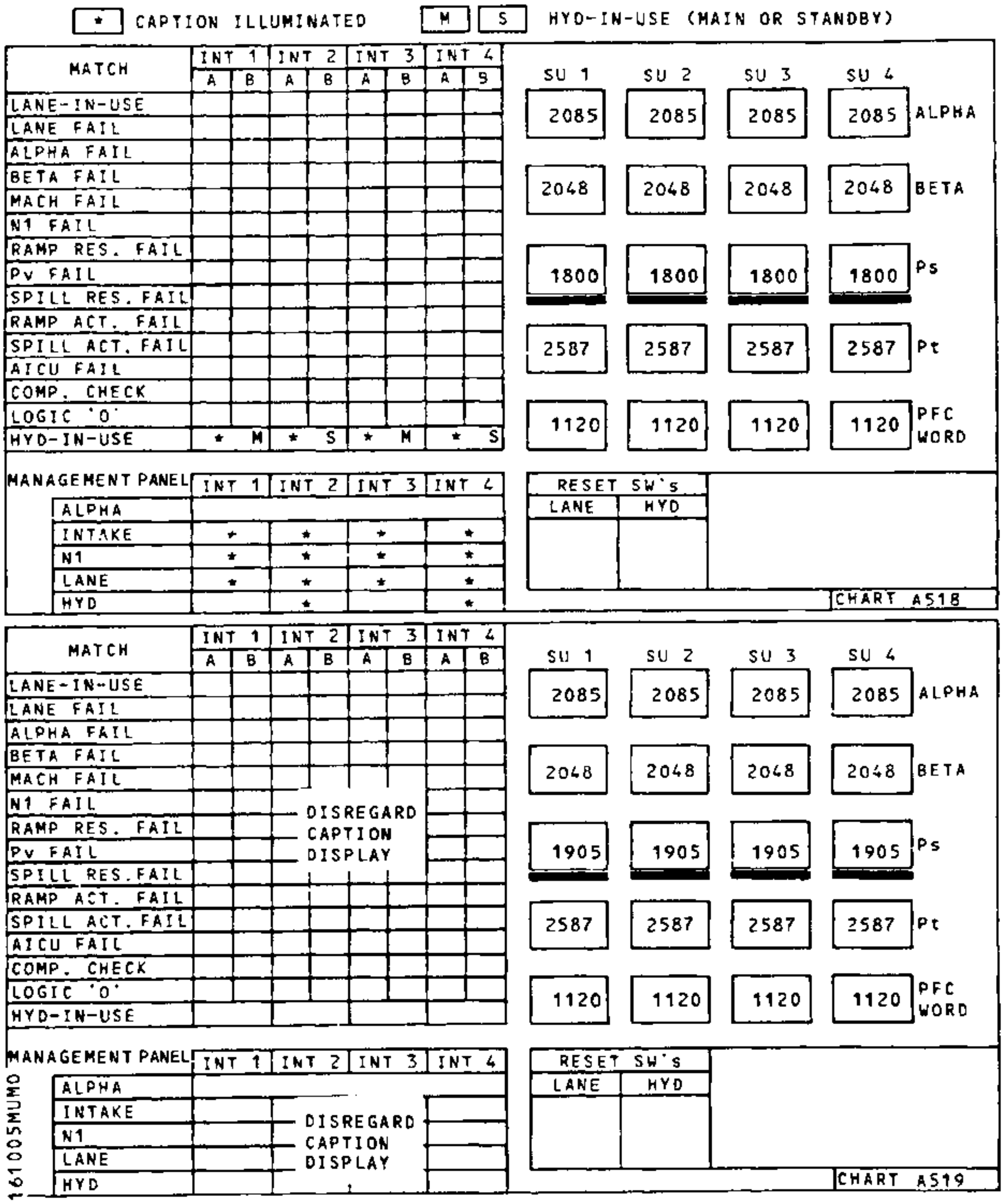
RESET SW's LANE	RESET SW's HYD

CHART A517

CMB7161005MMO

Charts A516 and A517

Charts A516 and A517



CMB71610005MUM0

Charts A518 and A519

Charts A518 and A519

[*] CAPTION ILLUMINATED [M] [S] HYD-IN-USE (MAIN OR STANDBY)

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES. FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	1905	1905	1905	1905
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD
PRESS	PRESS

CHART A520

MATCH	INT 1 A	INT 1 B	INT 2 A	INT 2 B	INT 3 A	INT 3 B	INT 4 A	INT 4 B
LANE-IN-USE	*		*		*		*	
LANE FAIL								
ALPHA FAIL								
BETA FAIL								
MACH FAIL								
N1 FAIL								
RAMP RES. FAIL								
Pv FAIL								
SPILL RES.FAIL								
RAMP ACT. FAIL								
SPILL ACT. FAIL								
AICU FAIL								
COMP. CHECK								
LOGIC '0'								
HYD-IN-USE	*	M	*	M	*	M	*	M

	SU 1	SU 2	SU 3	SU 4
ALPHA	2085	2085	2085	2085
BETA	2048	2048	2048	2048
Ps	2560	2560	2560	2560
Pt	2587	2587	2587	2587
PFC WORD	2656	2656	2656	2656

MANAGEMENT PANEL	INT 1	INT 2	INT 3	INT 4
ALPHA				
INTAKE				
N1				
LANE				
HYD				

RESET SW's LANE	RESET SW's HYD

CHART A521

CMB71610005MZMO

Charts A520 and A521

Charts A520 and A521

(3) Conclusion

(a) Set the intake test ON - OFF switch to "OFF"; close and wire-lock the switch guard in accordance with 20-21-13. Check that the ON caption is extinguished.

(b) Set the AICS GROUND - FLIGHT switches to "FLIGHT" and position the switch guards to maintain the switches at the "FLIGHT" position.

(c) Press the MWS RECALL push-switch and check that the MWS red INT captions remain extinguished.

(d) Set the RAMP - SPILL MASTER switches to "MAN". Check that the MWS red INT captions are illuminated; press-to-cancel the MWS red INT caption.

(e) Set the RESET - OFF switch on the AITP to "RESET" and release it. Check that all captions on the AITP are extinguished.

(f) Switch off the AISTS, trip the AITU supply circuit breakers (Ref. 71-61-18) and disconnect and remove the AISTS.

(g) Refit the air intake test unit (Ref.71-61-18).

(h) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(i) Remove the three hydraulic ground test rigs as detailed in 29-00-00.

(j) Remove all barriers and placards positioned in the preparation.

C. Preliminary Test - Using Air Intake System Test Set (AISTS) in Conjunction With the Aircraft Ground Hydraulic Check-out Pumps

(1) Prepare

(a) Ensure that for the duration of the test -

a1) the equipment racking air extraction system (Ref. 21-21-00) is operating, and

a2) the four intakes and the areas below the spill doors remain clear of persons and

equipment.

(b) Display placards, warning of AICS test in progress, and position barriers to prevent persons from inadvertently entering the area in the vicinity of the ramps and spill doors.

(c) Make available electrical ground power as detailed in 24-41-00.

(d) Check that the master warning system (MWS) (Ref. 33-15-00) and the associated audio warning system (AWS) (Ref. 31-23-00) are operating.

(e) Ensure that the MWS red and amber INT captions are extinguished; cancel them if necessary by pressing the face of each caption.

(f) Test the filaments (Ref. 33-14-00) on the ACP, the air intake test panel (AITP) and the auto N1 reduce lamp on the N1 indicators (Ref. 71-00-00).

(g) Set the RAMP - SPILL MASTER switches to "MAN". Check that the INT fail captions on the auto control panel (ACP) and the MWS red INT captions are illuminated, accompanied by the single-stroke gong; press-to-cancel the MWS red INT captions.

NOTE: If the MWS red INT captions are not cancelled, the single-stroke gong is repeated at approximately 8 s intervals.

(h) At the flying controls servo controls hydraulic selection panel (Ref. 27-34-00), set the upper switch to "NORMAL".

(i) At the flying controls relay jacks panel set the selector switch to "NORM".

(j) At the ground hydraulics check-out panel (Ref. 29-23-00) set -

j1) the hydraulic selector to "YELLOW-YELLOW",

j2) the hydraulic pump switch PUMP 1 G-Y to "ON", and

j3) after a short delay, the hydraulic pump

switch PUMP 2 B-Y to "ON" (both switches must not be switched on simultaneously).

(k) At the ACP set -

k1) the four lane select switches to "A",

k2) the four hydraulic select switches to "YELLOW" and

k3) confirm that the ramp and spill indicators display 0 per cent.

(l) Using the RAMP RAISE - LOWER inching switches, lower each ramp, in turn, approximately 20 per cent and then return it to the fully-up position (0 per cent).

(m) Using the SPILL SHUT - OPEN inching switches, open each spill door, in turn, approximately 20 per cent, wait for 3 s and check that during this time the spill door does not move and then return it to the fully closed position (0 per cent).

(n) At the ground hydraulic check-out panel set the hydraulic selector to GREEN-BLUE.

(o) At the ACP set the four hydraulic select switches to "AUTO".

(p) Repeat operations (l) and (m).

(q) Set the four RAMP - SPILL MASTER switches to "AUTO". Check that -

q1) the alpha, INT, LANE and HYD failure captions, the lane B lane-in-use lamps and the N1 indicators are extinguished, and

q2) the lane A lane-in-use lamps and the N1 SIG fail captions are illuminated, accompanied by the amber INT master warnings.

(r) Set the four RAMP - SPILL MASTER switches to "MAN".

(s) Press-to-cancel the MWS red INT captions.

(t) Press-to-test the N1 SIG, LANE and HYD failure captions on the ACP, in turn. Check that each caption is illuminated and the associated MWS amber INT caption is illuminated, accompanied by the sounding of a single-stroke gong.

(u) Press-to-test the alpha fail caption on the ACP. Check that the caption is illuminated and the four MWS amber INT captions are illuminated, accompanied by the sounding of a single-stroke gong.

(v) Remove the air intake test unit (Ref. 71-61-18).

(w) Set the four lane select switches to "AUTO".

(x) Ensure that the POWER SUPPLY 115 V/ON switch on the air intake system test set (AISTS) is set to 'off' (Ref. Fig. 501).

(y) Connect the AISTS to the air intake test unit connectors. Reset the circuit breakers tripped during the removal of the AITU and set the AISTS POWER SUPPLY switch to "ON". Check that the POWER SUPPLY lamp is illuminated.

(z) Press the LAMP TEST push-switch on the AISTS and check that all lamps are illuminated.

NOTE: The following procedure checks that the clock and address circuits of the test set are functioning, and the data output from any of the thumbwheel switches. The tests are written assuming SENSOR UNIT 1 ALPHA thumbwheel is to be checked, but sensor units 2, 3 and 4 outputs can be checked by pressing the appropriate INTAKE SELECTION button and adopting the same procedure.

During the self-test procedure the LANE A and LANE B TEST HIGHWAY DISPLAY on the test set should be identical.

(aa) Set the INTAKE SELECTION selector to "1", the DATA INTERRUPT switch to 'off' and the SELF-TEST switch to 'on'.

(ab) set all (five) thumbwheel selectors for Sensor Unit 1 to read 4095.

(ac) Check that all lamps in Column C in Table 503 are extinguished, except for the LANE FAIL and COMP. CHECK lamps.

(ad) Rotate the SENSOR UNIT 1 ALPHA thumbwheel selectors to the positions shown in Table 503, Column A, in turn. Check that at each position the associated TEST HIGHWAY DISPLAY lamp is illuminated and caused to flash approximately twice per second, while the remaining lamps in Column C remain static.

(ae) Set all the SENSOR UNIT 1 thumbwheels to 4095 and check that all lamps in Table 503, Column C, are illuminated except for the LANE FAIL and COMP CHECK lamps.

(af) Check that when the SENSOR UNIT 1 ALPHA thumbwheels are set, in turn, to the readings shown in Table 503, Column B, the associated lamp flashes approximately twice per second while the remaining lamps in Column C remain static.

(ag) Check that the SPILL ACTUATOR and HYDRAULICS IN USE lamps are flashing approximately twice per second, the AICU lamp is flashing approximately 4 times per second and the LOGIC 0 lamp is out.

(ah) Set the 'clock reduce' switch to 'on'.

(ai) Set all SU1 thumbwheels to 0006 as applied to SENSOR UNITS 2, 3 and 4, in turn.

(aj) Set the SENSOR UNIT 1 ALPHA thumbwheel to 0000 and check that each time the COMP CHECK lamp is lit the address lamps shown in Table 504 are in the state indicated for ALPHA.

(ak) Reset the ALPHA thumbwheel switch to 0006 and carry out a similar test with the SU1 BETA, Ps, Pt and PFC WORD thumbwheels set to 0000, in turn, in conjunction with the appropriate address lamps shown on Table 504; after each test reset the tested thumbwheel to 0006.

(al) Cancel the self test and check that the SELF TEST caption is extinguished.

(am) At the ram air turbine (RAT) test panel (Ref. 29-24-00) set the AICS GROUND - FLIGHT switch for No.1 intake to "GROUND" and check that the MWS red INT caption for each intake is illuminated, accompanied by a single-stroke gong. Return the switch to the "FLIGHT" position and check that the MWS red INT captions are extinguished.

(an) Repeat operation (am) as applied to the No.1 intake AICS GROUND - FLIGHT switch for Nos. 2, 3 and 4 intakes, in turn.

(ao) At the AITP set the intake test ON - OFF switch to "ON" and check that the ON caption and the MWS red INT caption for each intake are illuminated, accompanied by a single-stroke gong. Return the switch to "OFF" and check that the ON caption and the MWS red INT captions are extinguished.

(ap) Set the AICS GROUND - FLIGHT switches to "GROUND" and the AITP intake test ON - OFF switch to "ON".

(aq) Press-to-cancel the MWS red INT captions.

(2) Test

(a) Set the RAMP - SPILL MASTER switches for intakes 1 and 2 to "AUTO".

(b) At the ground hydraulic check-out panel set the hydraulics selector to "YELLOW-YELLOW".

(c) Trip the following circuit breaker and fit a safety clip.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
PFC IND	1-213	C287	N18

(d) At the flying controls servo controls hydraulic selection panel (Ref.27-34-00) -

d1) Set the upper switch to "BLUE ONLY",

d2) Press-to-cancel the MWS PFC, FEEL and HYD captions, and

d3) Check that the blue solenoid selector lamps are lit.

After SB 27-043 For A/C 001-007,

(c) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
YELL L/L (PFC & RELAY JACK 'A' SYS CONT)	1-213	C288	P18
YELL L/L (PFC & RELAY JACK 'B' SYS CONT)	3-213	C282	A8

(d) At the flying controls servo controls hydraulic selection panel (Ref. 27-34-00) -

d1) set the upper switch to "BLUE ONLY",

d2) check that the GREEN L.PRESS caption is illuminated,

d3) press-to-cancel the MWS PFC, FEEL and HYD captions, and

d4) check that the blue solenoid selector lamps are lit.

(e) At the flying controls relay jacks panel set the selector switch to "BLUE ONLY".

(f) At the ground hydraulics check-out panel set the hydraulics selector to "GREEN-YELLOW".

(g) At the AISTS depress the INTERRUPT switch and set the ALPHA, BETA, Ps, Pt and PFC WORD thumbwheels for each SENSOR UNIT (SU) as shown on Chart 501. Release the INTERRUPT switch.

(h) Perform the tests detailed on Charts 502 to 599 and A501 to A521, in turn, on intakes 1 and 2, using the following procedure:-

h1) Depress the INTERRUPT switch whenever adjustments to the thumbwheel settings are being made, then release the INTERRUPT switch to continue the test.

NOTE: Thumbwheel settings which differ from those shown on the previous Chart are underlined thus, 2656, and only these thumbwheels require to be reset.

h2) When LANE and HYD RESET is requested on a Chart by the word PRESS appearing in the adjacent box -

set the thumbwheels to the indicated positions,

allow at least 1 s to elapse after setting the thumbwheels, then hold the HYD RESET switch depressed for 1 s,

allow at least 1 s to elapse after pressing the HYD RESET switch, then hold the LANE RESET switch depressed for 1 s,

ensure that the MATCH captions on the appropriate Chart match the lamps illuminated on the AISTS TEST HIGHWAY DISPLAY, for intakes 1 and 2, by pressing the INTAKE SELECTION captions 1 and 2, in turn, and

ensure that the MANAGEMENT PANEL captions on the appropriate Chart match the lamps illuminated on the AISTS MANAGEMENT PANEL FAILURE DISPLAY.

NOTE: The MANAGEMENT PANEL captions on the AISTS will indicate

INT failure for intakes 3 and 4.

The test sequence may be restarted at any of the Charts which include HYD and LANE RESETS.

(i) At the ground hydraulic check-out panel select "YELLOW-YELLOW".

(j) At the flying controls servo controls hydraulic selection panel -

j1) Set the upper switch to "GREEN ONLY".

j2) Press-to-cancel the MWS PFC, FEEL and HYD captions, and

j3) Check that the two green solenoid selector lamps are lit.

After SB 27-043 For A/C 001-007,

(j) At the flying controls servo controls hydraulic selection panel -

j1) set the upper switch to "GREEN ONLY",

j2) check that the BLUE L. PRESS caption is illuminated,

j3) press-to-cancel the MWS PFC, FEEL and HYD captions, and

j4) check that the two green solenoid selector lamps are lit.

(k) At the flying controls relay jacks panel set the selector switch to "GREEN ONLY".

(l) At the ground hydraulics check-out panel set the hydraulic selector to "BLUE-YELLOW".

(m) At the ACP set the RAMP - SPILL MASTER switches for intakes 1 and 2 to "MAN" and for intakes 3 and 4 to "AUTO". Press-to-cancel the MWS red INT captions for intakes 1 and 2.

(n) At the AISTS depress the INTERRUPT switch and set the ALPHA, BETA, Ps, Pt and PFC WORD thumbwheels for each SENSOR UNIT (SU) as shown on Chart 501. Release the INTERRUPT switch.

(o) Perform the tests detailed on Charts 502 to 599 and A501 to A521, in turn, on intakes 3 and 4, using the following procedure:-

o1) Depress the INTERRUPT switch whenever adjustments to the thumbwheel settings are being made, then release the INTERRUPT switch to continue the test.

NOTE: Thumbwheel settings which differ from those shown on the previous Chart are underlined thus, 2656, and only these thumbwheels require to be reset.

o2) When LANE and HYD RESET is requested on a Chart by the word PRESS appearing in the adjacent box -

set the thumbwheels to the indicated positions,

allow at least 1 s to elapse after setting the thumbwheels, then hold the HYD RESET switch depressed for 1 s,

allow at least 1 s to elapse after pressing the HYD RESET switch, then hold the LANE RESET switch depressed for 1 s,

ensure that the MATCH captions on the appropriate Chart match the lamps illuminated on the AISTS TEST HIGHWAY DISPLAY, for intakes 3 and 4, by pressing the INTAKE SELECTION captions 3 and 4, in turn, and

ensure that the MANAGEMENT PANEL captions on the appropriate Chart match the lamps illuminated on the AISTS MANAGEMENT PANEL FAILURE DISPLAY.

NOTE: The MANAGEMENT PANEL captions on the AISTS will indicate

INT failure for intakes 1 and 2.

The test sequence may be restarted at any of the Charts which include HYD and LANE RESET.

(3) Conclusion

(a) Set the intake test ON - OFF switch to "OFF"; close and wire-lock the switch guard in accordance with 20-21-13. Check that the ON caption is extinguished.

(b) Set the RAMP - SPILL MASTER switches for intakes 1 and 2 to "AUTO".

(c) Set the AICS GROUND - FLIGHT switches to "FLIGHT" and position the switch guards to maintain the switches at the FLIGHT position.

(d) Press the MWS RECALL push-switch and check that the MWS red INT captions remain extinguished.

(e) Set the RAMP - SPILL MASTER switches for intakes 1, 2, 3 and 4 to "MAN". Check that the MWS red INT captions for intakes 1, 2, 3 and 4 are illuminated; press-to-cancel the MWS red INT captions.

(f) Set the RESET - OFF switch on the AITP to "RESET" and release it. Check that all captions on the AITP are extinguished.

(g) At the ground hydraulics check-out panel set the hydraulics pump switches PUMP 1 G-Y and PUMP 2 B-Y to "OFF".

R (h) Remove safety clip and close the following circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
PFC IND	1-213	C287	N18

After SB 27-043 For A/C 001-007,

R (h) Remove safety clips and close the following circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
YELL L/L (PFC RELAY JACK 'A' SYS CONT)	1-213	C288	P18
YELL L/L (PFC RELAY JACK 'B' SYS CONT)	3-213	C282	A8

R (i) Switch off the AISTS, trip the AITU supply circuit breakers (Ref. 71-61-18) and disconnect and remove the AISTS.

R (j) Refit the air intake test unit (Ref. 71-61-18).

R (k) Switch off and disconnect electrical ground power as detailed in 24-41-00.

R (l) Remove all barriers and placards positioned in the preparation.

R

R D. Test - Inhibit of Test Unit with Weight Switches at Flight Condition

CAUTION: SUBSEQUENT TEST PROCEDURES REQUIRE THE TRIPPING OF CIRCUIT BREAKERS, TO ESTABLISH THE LEFT-HAND WEIGHT SWITCH OPERATED RELAYS IN THE FLIGHT CONDITION. CARE MUST BE TAKEN TO ENSURE THAT ALL SERVICES ADVERSELY AFFECTED BY THIS CONDITION ARE PREVIOUSLY ISOLATED (REF. 7-11-00).

(1) Prepare

(a) Make available electrical ground power as detailed in 24-41-00.

(b) Set the pre-flight check master switch on the air intake test panel to "ON". Check that the ON caption is illuminated.

(c) Set the pre-flight check master switch to "OFF". Check that the ON caption is extinguished.

(2) Test

(a) Trip the LH UC WEIGHT SW 'B' SYS SUP circuit breaker G293 on panel 3-213, map ref.B8, and fit a safety clip.

(b) Set the pre-flight check master switch to "ON". Check that the ON caption remains extinguished.

(c) Remove the safety clip and reset circuit breaker G293. Check that the ON caption is illuminated.

(d) Set the pre-flight check master switch to "OFF". Check that the ON caption is extinguished.

(3) Conclusion

(a) Switch off and disconnect electrical ground power as detailed in 24-41-00.

END OF THIS SECTION

NEXT

AIR INTAKE SENSOR UNIT - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Four air intake sensor units (AISUs) are housed in 3/8 ATR short cases in the flight compartment racking. The units are designated Nos.1 to 4 inclusive and are mounted on shelves 10-215 (Nos.1 and 2, rear and forward respectively) and 10-216 (Nos.3 and 4, forward and rear respectively).

Electrical connections are made via connectors mounted on the unit backplate and manometric connections are made by flexible hoses.

2. Air Intake Sensor Unit

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Torque spanner, 0 to 200 lbf in R (0 to 2.26 mdaN) with suitable R adaptors	-

B. Prepare

(1) Electrically isolate the intake test panel by tripping the TEST PANEL SUP circuit breaker K1755 on panel 15-216, map ref.C8.

(2) Electrically isolate the appropriate sensor unit by tripping the associated circuit breakers listed below. Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
NO.1 SENSOR UNIT			
SENSOR UNIT 1 SUP	2-213	1K2052	A14

R

R

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INCIDENCE SENSOR 1 SUP	4-213	1K1900	G17
NO.2 SENSOR UNIT			
SENSOR UNIT 2 SUP	13-216	2K2052	B4
INCIDENCE SENSOR 1 SUP	4-213	1K1900	G17
NO.3 SENSOR UNIT			
SENSOR UNIT 3 SUP	2-213	3K2052	G14
INCIDENCE SENSOR 2 SUP	2-213	2K1900	C14
NO.4 SENSOR UNIT			
SENSOR UNIT 4 SUP	14-216	4K2052	C5
INCIDENCE SENSOR 2 SUP	2-213	2K1900	C14

(3) Remove the appropriate cover from the flight compartment racking and identify the sensor unit.

C. Remove

(1) Disconnect the pitot/static flexible hoses from the
R sensor unit and fit approved blanks to the pipe ends
R and sensor unit orifices.

(2) Loosen the clamping nut assemblies and remove them from the sensor unit hold-down hooks.

(3) Grasp the carrying handle and carefully withdraw the sensor unit from the backplate connectors and remove it from the shelf.

D. Install

(1) Comply with the electrical safety precautions.

(2) Remove the blanks from the electrical connectors and ensure that all pins, inserts and mating surfaces are clean and undamaged.

(3) Place the sensor unit on the shelf runners and carefully push it backward until fully engaged with the backplate connectors. Ensure that the sensor unit is bonded in accordance with 20-27-11.

(4) Engage the clamping nut assemblies with the sensor unit hold-down hooks and tighten the nuts, using hand pressure only. The sensor unit must be sufficiently secure to prevent sideways movement but not so tight that deflection of the backplate occurs.

(5) Remove the blanks from the pitot/static hoses and the sensor unit orifices; ensure that the connectors are clean and free from obstruction and that the threads are undamaged.

(6) Reconnect the pitot/static flexible hoses, using the procedures and torque loadings detailed in 20-23-11 and 20-23-12.

E. Conclusion

(1) Refit and secure the cover to the rack.

(2) Remove the safety clips and reset the circuit breakers tripped before removal.

(3) Carry out the appropriate Operational Test as detailed in 71-61-18, Adjustment/Test, '2. Operational Test - Test Unit (AITU), Sensor Unit (AISU) or Control Unit (AICU)'.

R B (4) Carry out pitot static leak check - refer to Chapter
R B 34-10-00.

R B F. Leak Testing Pitot/Static Systems (EN.6379)
R B Leak Checks must be carried out when:-

R B (1) Any connection in the STANDBY pitot/static system is
R B disturbed e.g. No.2 "Air Intake Sensor Unit".

R B (2) If more than one pitot and one static quick release
R B connection are disturbed in one main system e.g.
R B No.3 or No.4 Air Intake Sensor Unit.

R B (3) If any quick release connections in both main
R B pitot/static systems are disturbed, both systems
R B must be leak checked e.g. interchange of Air
R B Intake Sensor Units.

R B No leak check is required if only one pitot and one
R B static quick release connections or only one system

R B are disturbed e.g. a single Air Intake Sensor Unit
R B change.

AIR INTAKE TEST PANEL - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

The intake test panel is mounted, by four quick-release fasteners, on the left-hand side of the third crew member's (3CM) management panel.

2. Test Panel

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare

R B CAUTION: AIR INTAKE TEST PANEL LRU CAPTIONS HAVE SUFFERED OVERHEAT
R B DAMAGE. DO NOT FIT BULBS OF GREATER WATTAGE THAN 25mA.

R B NOTE: Bulbs P/N 6839 as illustrated in IPC 71-61-10 Page 5-2 are
R B 25mA rated and are the correct size for the Air Intake Test
R B Panel LRU captions.
R B In future only bulbs that are 25mA rated such as P/N 6839
R B are to be used for the AITU P/N EAU 790.

(1) Set the PANEL lighting control switch on lighting control panel 11-214 to the 'off' position.

(2) Ensure that the LIGHTS TEST switch on control panel 12-214 is in the HI position.

(3) Electrically isolate the panel by tripping all the circuit breakers listed below. Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
TEST PNL SUP	15-216	K1755	C8
3CM STN LH LT TEST SUP 1	15-216	L1003	C12
3CM STN LH LT TEST SUP 2	15-216	L1004	C13
3CM STN PNL LTS SUP	14-216	L86	D9

C. Remove

(1) Release the four quick-release fasteners and partially withdraw the panel.

(2) Disconnect the electrical connector and remove the panel.

D. Install

(1) Comply with the electrical safety precautions.

(2) Remove the protective blanks from the electrical connectors and ensure that all pins, inserts and mating surfaces are clean and undamaged.

(3) Set the pre-flight check INTAKE TEST selector switch to the guarded "OFF" position and the RESET and CONTINUE switches to "OFF". Support the panel and connect the electrical connectors, ensuring that the connector identifications correspond.

(4) Position the cable assemblies to prevent trapping, fully insert the panel and secure it with the quick-release fasteners.

E. Conclusion

(1) Remove the safety clips and reset the circuit breakers tripped before removal.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Hold the LIGHTS TEST switch on control panel 12-214 in the "TEST" position and check that all caption filaments on the AITP are illuminated; release the switch and ensure that all captions are extinguished.

R (4) Ensure that the N1 SIG failure caption on the
R AICS auto control panel is illuminated. Hold the
R LIGHTS TEST switch on control panel 12-214 in the
R "LO" position and check that the brilliance of the
R N1 SIG failure caption is reduced; release the
R switch and check that full brilliance is restored.

R (5) Set the PANEL lighting control switch on lighting control panel 11-214 to the 'on' position. Check that the test panel engravings are illuminated and return the switch to the 'off' position.

R (6) Carry out the appropriate Preliminary Test as
R detailed in 71-61-00, Adjustment/Test, '3.
R Operational Test (Excluding Ramp Manual Inching,
R Spill Door Manual Inching and Auxiliary Inlets)'.

AUTO CONTROL PANEL - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

The auto control panel is situated on the left-hand side of the third crew member's (3CM) management panel and is front-mounted. Releasing six quick-release captive fasteners enables the control panel to be partially withdrawn, and allows access to the interconnecting cable connectors which
R can then be disconnected to permit the complete removal of the panel.

2. Control Panel

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare

(1) Electrically isolate the panel by tripping all the circuit breakers listed below. Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 STBY HYD SUP	15-216	1K1960	B8
INTERFACE UNIT 1A/2B SUP	1-213	1K1976	H9
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 STBY HYD SUP	1-213	2K1960	E9
INTERFACE UNIT 2A/1B SUP	15-215	2K1976	D18
INT 3 MAIN HYD SUP	5-213	3K1950	A7

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 3 STBY HYD SUP	15-215	3K1960	C18
INTERFACE UNIT 3A/4B SUP	5-213	3K1976	D6
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 STBY HYD SUP	5-213	4K1960	A6
INTERFACE UNIT 4A/3B SUP	15-216	4K1976	D8
3CM STN PNL LTS SUP	14-216	L86	D9
3CM STN LH LT TEST SUP 2	15-216	L1004	C13
R 3CM STN INST LTS SUP	13-216	L377	E7
INT 1 IND SUP	5-213	1E531	C6
INT 2 IND SUP	5-213	2E531	C7
INT 3 IND SUP	1-213	3E531	G9
INT 4 IND SUP	1-213	4E531	F9

C. Remove

(1) Release the quick-release fasteners and partially withdraw the panel.

(2) Disconnect the electrical connectors and remove the panel.

D. Install

(1) Comply with the electrical safety precautions.

(2) Remove the protective blanks from the appropriate electrical connectors, and ensure that all pins, inserts and mating surfaces are clean and undamaged.

(3) Support the panel and connect the electrical

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connectors, ensuring that the connector identifications correspond.

(4) Position the cable assemblies to prevent trapping, then fully insert the panel and secure it with the quick-release fasteners.

E. Conclusion

(1) Set the four LANE select switches to the "AUTO A" position and the four HYDRAULIC select switches to the "AUTO" position.

(2) Ensure that the four RAMP/SPILL MASTER switches are guarded in the AUTO position.

(3) Remove the safety clips and reset the circuit breakers tripped before removal.

(4) Make available electrical ground power as detailed in 24-41-00.

(5) Hold the LIGHTS TEST switch on panel 12-214 in the "TEST" position and check that all filaments on the control panel are lit; release the switch and ensure that all filaments are extinguished.

(6) Set the PANEL lighting control switch on panel 11-214 to the 'on' position. Check that the control panel engravings are illuminated and return the switch to the 'off' position.

(7) In each air intake, open and close the auxiliary air inlet vanes and check that the corresponding positions are correctly displayed on the auxiliary air inlet VANE magnetic indicators on the control panel.

(8) Carry out the appropriate Preliminary Test as detailed in 71-61-00, Adjustment/Test,
R '3. Operational Test (excluding Ramps Manual
R Inching, Spill Doors Manual Inching and Auxiliary
R Inlets)'.

AIR INTAKE TEST UNIT - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

The air intake test unit (AITU) is housed in a 1/2 ATR short case and mounted on shelf 9-216 in the flight compartment RH racking.

2. Test Unit

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare

R (1) Electrically isolate the air intake test unit
R (AITU) by tripping the following circuit breakers.
R Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
TEST PNL SUP	15-216	K1755	C8
TEST UNIT SUP	13-216	K1754	A4

R (2) Ensure that the three pre-flight check switches
R on the air intake test panel (AITP) at the third
R crew member's station are at the OFF position.

R (3) Remove the appropriate cover from flight compartment
R racking 9-216 and identify the unit.

C. Remove

(1) Loosen the clamping nut assemblies and remove them from the unit hold-down hooks.

(2) Grasp the carrying handle and carefully withdraw the unit from the backplate connector and remove it from the shelf.

D. Install

(1) Comply with the electrical safety precautions.

(2) Remove the protective blanks from the electrical connectors and ensure that all pins, inserts and mating surfaces are clean and undamaged.

(3) Place the unit on the shelf runners and carefully push the unit backward until fully engaged with the backplate connector. Ensure that the unit is bonded in accordance with 20-27-11.

(4) Engage the clamping nut assemblies with the unit hold-down hooks and tighten the nuts, using hand pressure only. The unit must be made sufficiently secure to prevent sideways movement but not so tight that deflection of the backplate occurs.

E. Conclusion

R (1) Refit and secure the cover to flight compartment
R racking 9-216.

R (2) Remove the circuit breakers safety clips and reset the
R circuit breakers tripped before removal.

(3) Carry out an Operational Test of the system as
R detailed in 71-61-18, Adjustment/Test,
R '2. Operational Test - Test Unit (AITU),
R Sensor Unit (AISU) or Control Unit (AICU)'

AIR INTAKE TEST UNIT - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

1. General

The air intake control system (AICS), after renewal of an air intake test unit (AITU), is tested by using any one of the following Functional/Operational procedures depending on the equipment available. The first, (Functional Test), uses three ground hydraulic supplies (Ref.para.2.A); the second, (Functional Test), uses one ground hydraulic supply and two aircraft ground hydraulic check-out pumps (Ref.para.2.B); the third, (Operational Test), uses two aircraft ground hydraulic check-out pumps (Ref.para.2.C).

The test of the AICS detailed in paragraph 2 is also applicable after renewal of an air intake sensor unit (AISU) (Ref. 71-61-11, Removal/Installation), or an air intake control unit (AICU) (Ref.71-61-21, Removal/Installation).

A System Test is not applicable in this instance.

2. Operational/Functional Test - Test Unit (AITU), Sensor Unit (AISU) or Control Unit (AICU)

A. Functional Test in Conjunction with Three Ground Hydraulic Test Rigs

(1) Prepare

(a) Make available electrical ground power as detailed in 24-41-00.

(b) Ensure that for the duration of the test -

b1) the equipment racking air extraction system (Ref. 21-21-00) is operating, and

b2) the four intakes and the areas below the spill doors remain clear of persons and equipment.

(c) Post notices, warning of AICS Functional Test in progress, and position barriers to prevent persons from inadvertently entering the area in the vicinity of the ramps and spill doors.

(d) Check that the master warning system (MWS) (Ref. 33-15-00) and the associated audio warning system (AWS) (Ref. 31-23-00) are operating.

(e) Make available hydraulic ground power to the main hydraulic systems (GREEN and BLUE) and to the standby hydraulic system (YELLOW) (Ref. Chap.29); ensure that the hydraulic operating pressures are normal.

(f) Ensure that the MWS red and amber INT captions are extinguished; cancel them if necessary.

(2) Test

(a) Set the RAMP - SPILL MASTER switches to "MAN"; press-to-cancel the MWS red INT captions.

NOTE: If the master warning system (red) is not cancelled the single-stroke gong tone is repeated at approximately 8 s intervals.

(b) Confirm that the ramp and spill position indicators display 0 per cent.

(c) Set the four hydraulic select switches to "AUTO".

(d) Set the four lane select switches to "AUTO A".

R (e) At the ram air turbine (RAT) test panel (Ref.29-24-00), set the AICS GROUND FLIGHT switches to "GROUND". Check that the MWS red INT caption for each intake is illuminated, accompanied by a single-stroke gong.

R (f) At the AITP, set the intake test ON-OFF switch to "ON". Check that the HOLD caption is illuminated after a delay of approximately 7 s.

R NOTE: A random light pattern will occur on the ACP and the AITP until the test program is commenced by the use of the CONTINUE-OFF switch.

R (g) Press-to-cancel the MWS red INT captions.

R (h) Set the four RAMP - SPILL MASTER switches to "AUTO".

R (i) Start the test program by setting the CONTINUE - OFF switch on the AITP to "CONTINUE". Check that the HOLD caption is extinguished and remains extinguished, and that after approximately 5 min the N1 REQD caption is illuminated.

NOTE: Illumination of the N1 REQD caption, provided that the HOLD caption has not been re-illuminated during the test program, indicates the successful completion of the Preliminary Test. The GO caption can be illuminated only on the successful completion of the N1 probe checks, which require all engines to be running.

Illumination of the HOLD caption during the test, accompanied by the appropriate equipment failure caption and a binary pattern address display, indicates that a failure has been detected and that the test sequence
R has stopped (Ref. 71-00-39, Trouble
R Shooting). The test sequence can be continued by resetting the
R CONTINUE - OFF switch to "CONTINUE".

The RESET switch on the AITP allows the test program to be reset to the beginning at any time during the test sequence.

(3) Conclusion

(a) Set the intake test ON - OFF switch to "OFF" and close and wire-lock the switch guard in accordance with 20-21-13. Check that the ON caption is extinguished.

R (b) Set the AICS GROUND-FLIGHT switches to
R "FLIGHT" and position the switch guards to
R maintain the switches at the "FLIGHT" setting.

R (c) Press the MWS RECALL push-switch and check that
R the MWS red INT captions remain extinguished.

R (d) Set the RAMP-SPILL MASTER switches to "MAN".
R Press-to-cancel the MWS red INT captions.

R (e) Switch off and disconnect electrical ground power as detailed in 24-41-00.

R (f) Disconnect and remove the ground hydraulic supply rigs (Ref. Chap.29).

R (g) Remove all barriers and warning placards.

R B. Functional Test - in Conjunction with One Ground Hydraulic Supply and Two Aircraft Ground Hydraulic Check-Out Pumps

(1) Prepare

(a) Make available electrical ground power as detailed in 24-41-00.

(b) Connect the ground hydraulic supply to the yellow hydraulic system (Ref. Chap.29).

(c) Ensure that for the duration of the test -

c1) the equipment racking air extraction system (Ref. 21-21-00) is operating and

c2) the four intakes and the areas below the spill doors remain clear of persons and equipment.

R (d) Post notices, warning of AICS Functional Test in progress, and position barriers to prevent persons from inadvertently entering the area in the vicinity of the ramps and spill doors.

(e) Check that the master warning system (MWS) (Ref. 33-15-00) and the associated audio warning system (AWS) (Ref. 31-23-00) are operating.

(f) Ensure that the MWS red and amber INT captions are extinguished; cancel them if necessary.

(2) Test

(a) Set the RAMP - SPILL MASTER switches to "MAN"; press-to-cancel the MWS red INT captions.

<u>NOTE</u>: If the master warning system (red)

is not cancelled the single-stroke gong tone is repeated at approximately 8 s intervals.

(b) At the flying controls servo controls hydraulic selection panel (Ref. 27-34-00), set the upper switch to "BLUE ONLY" and the lower switch to "YELLOW-BLUE". Check that -

R

b1) the GREEN L. PRESS caption is illuminated, and

b2) the two blue solenoid selector lamps are lit.

(c) At the flying controls relay jacks panel (Ref. 27-34-00) set the selector switch to "BLUE ONLY".

(d) At the ground hydraulics check-out panel (Ref. 29-23-00)-

R

R d1) Set the hydraulic selector to "GREEN-BLUE",

R d2) Set the hydraulic pump switch PUMP 1 G-Y to "ON", and

R d3) after a short delay, set the hydraulic pump switch PUMP 2 B-Y to "ON" (both pumps must not be switched on simultaneously).

(e) Confirm that the ramp and spill indicators display 0 per cent.

(f) At the ACP set the four hydraulic select switches to "AUTO".

(g) Set the four lane select switches to "AUTO A".

R R R R R (h) At the ram air turbine (RAT) test panel (Ref. 29-24-00), set the AICS GROUND-FLIGHT switches to "GROUND". Check that the MWS red INT caption for each intake is illuminated, accompanied by a single-stroke gong.

R R R (i) At the AITP, set the intake test ON-OFF switch to "ON". Check that the HOLD caption is illuminated after approximately 7 s.

NOTE: A random light pattern will occur on the ACP and AITP until the test program is commenced by use of the CONTINUE - OFF switch.

R (j) Press-to-cancel the MWS red INT captions.

R (k) Set the RAMP - SPILL MASTER switches to "AUTO".

R (l) Start the test program by setting the CONTINUE - OFF switch on the AITP to "CONTINUE". Check that the HOLD caption is extinguished and remains extinguished, and that after approximately 5 min the N1 REQD caption is illuminated.

NOTE: Illumination of the N1 REQD caption, provided that the HOLD caption has not been illuminated during the test program, indicates the successful completion of the Preliminary Test. The GO caption can be illuminated only on the successful completion of the N1 probe checks, which require all engines to be running.

Illumination of the HOLD caption during the test, accompanied by the appropriate equipment failure caption and a binary address display, indicates that a failure has been detected and that the test sequence
R has stopped (Ref. 71-00-39, Trouble
R Shooting). The test sequence can be continued by resetting the CONTINUE -
R OFF switch to "CONTINUE".

The RESET switch on the AITP allows the test program to be reset to the beginning at any time during the test sequence.

(3) Conclusion

(a) Set the intake test ON - OFF switch to "OFF" and close and wire-lock the switch guard in accordance with 20-21-13. Check that the ON caption is extinguished.

R (b) Set the AICS GROUND-FLIGHT switches to "FLIGHT" and position the switch guards to maintain the switches at the "FLIGHT" position.

R (c) Press the MWS RECALL push-switch and check that the MWS red INT captions remain extinguished.

R (d) Set the RAMP-SPILL MASTER switches to "MAN". Press-to-cancel the MWS red INT failure captions.

R (e) At the ground hydraulics check-out panel set the hydraulic pump switches PUMP 1 G-Y and PUMP 2 B-Y to "OFF".

R (f) At the flying controls servo controls hydraulic selection panel, set the upper and lower switches to "NORMAL".

R (g) At the flying controls relay jacks panel, set the selector switch to "NORM".

R (h) Switch off and disconnect electrical ground power as detailed in 24-41-00.

R (i) Disconnect and remove the ground hydraulic supply (Ref. Chap.29).

R (j) Remove all barriers and warning placards.

C. Operational Test - in Conjunction with Two Aircraft Ground Hydraulic Check-out Pumps

(1) Prepare

(a) Make available electrical ground power as detailed in 24-41-00.

(b) Ensure that for the duration of the test -

b1) the equipment racking air extraction system (Ref. 21-21-00) is operating, and

b2) the four intakes and the areas below the spill doors remain clear of persons and equipment.

(c) Post notices, warning of AICS Operational Test in progress, and position barriers to prevent persons from inadvertently

entering the area in the vicinity of the ramps and spill doors.

(d) Check that the master warning system (MWS) (Ref. 33-15-00) and the associated warning system (AWS) (Ref. 31-23-00) are operating.

(e) Ensure that the MWS red and amber INT captions are extinguished; cancel them if necessary.

(2) Test

(a) Set the RAMP - SPILL MASTER switches to "MAN"; press-to-cancel the MWS red INT captions.

NOTE: If the master warning system (red) is not cancelled the single-stroke gong tone is repeated at approximately 8 s intervals.

(b) At the flying controls servo controls hydraulic selection panel (Ref. 27-34-00) set the upper switch to "NORMAL".

(c) At the flying controls relay jacks panel (Ref. 27-34-00) set the selector switch to "NORM".

(d) Trip the following circuit breaker and fit a safety clip.

R

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
PFC IND	1-213	C287	N18

R R R R

After SB 27-043 For A/C 001-007,

(d) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
YELL L/L PFC & RELAY JACK 'A' SYS CONT	1-213	C288	P18
YELL L/L PFC & RELAY JACK 'B' SYS CONT	3-213	C282	A 8

(e) At the flying controls servo controls hydraulic selection panel (Ref.27-34-00)-

e1) set the upper switch to "BLUE-ONLY",

e2) press-to-cancel the MWS PFC, FEEL and HYD captions, and

e3) Check that the two blue solenoid selector lamps are lit.

After SB 27-043 For A/C 001-007,

(e) At the flying controls servo controls hydraulic selection panel (Ref. 27-34-00) -

e1) set the upper switch to "BLUE-ONLY",

e2) check that the GREEN L. PRESS caption is illuminated,

e3) press-to-cancel the MWS PFC, FEEL and HYD captions, and

e4) check that the two blue solenoid selector lamps are lit.

(f) At the flying controls relay jacks panel set the selector switch to "BLUE ONLY".

(g) At the ground hydraulics check-out panel-

g1) Set the hydraulics selector to "GREEN-YELLOW",

R g2) Set the hydraulic pump switch PUMP 1 G-Y
R to "ON", and

R g3) after a short delay, set the hydraulic
R pump switch PUMP 2 B-Y to "ON" (both pumps must not be switched on simultaneously).

(h) Confirm that the ramp and spill door indicators display 0 per cent.

(i) At the ACP set the four hydraulic select switches to "AUTO".

(j) Set the four lane select switches to "AUTO A".

R (k) At the ram air turbine (RAT) test panel
R (Ref. 29-24-00), set the AICS GROUND-FLIGHT
R switches to "GROUND". Check that the MWS red
R INT caption for each intake is illuminated,
R accompanied by a single-stroke gong.

R (l) At the AITP, set the intake test ON-OFF
R switch to "ON". Check that the HOLD caption
R is illuminated after a delay of approximately
R 7 s.

<u>NOTE</u>: A random light pattern will occur on the ACP and AITP until the test program is commenced by use of the CONTINUE - OFF switch.

R (m) Press-to-cancel the MWS red INT captions.

R (n) Set the RAMP - SPILL MASTER switches for intakes 1 and 2 to "AUTO".

R (o) Set the CONTINUE - OFF switch on the AITP to "CONTINUE". Check that the CHK HYD caption is illuminated.

R (p) Start the test program by setting the CONTINUE - OFF switch on the AITP to "CONTINUE". Check that the HOLD caption is extinguished and remains extinguished, and that after approximately 5 min the B/Y REQD caption is illuminated.

<u>NOTE</u>: Illumination of the B/Y REQD caption, provided that the HOLD caption has not been re-illuminated during the test

program, indicates the successful completion of the Preliminary Test on intakes 1 and 2. The GO caption can be illuminated only on the successful completion of the N1 probe checks, which require all engines to be running.

Illumination of the HOLD caption during the test, accompanied by the appropriate equipment failure caption and a binary address display, indicates that a failure has been detected and that the test sequence has stopped (Ref.71-00-39 Trouble Shooting.) The test sequence can be continued by resetting the CONTINUE - OFF switch to "CONTINUE".

The RESET switch on the AITP allows the test program to be reset to the beginning at any time during the test sequence.

(q) At the ground hydraulics check-out panel, change the hydraulic supplies from GREEN-YELLOW to YELLOW-YELLOW.

(r) At the flying controls servo controls hydraulic selection panel-

r1) set the upper switch to "GREEN ONLY",

r2) press-to-cancel the MWS PFC, FEEL and HYD captions, and

r3) check that the two green solenoid selector lamps are lit.

After SB 27-043 For A/C 001-007,

(r) At the flying controls servo controls hydraulic selection panel -

r1) set the upper switch to "GREEN ONLY",

r2) check that the BLUE L. PRESS caption is illuminated,

r3) press-to-cancel the MWS PFC, FEEL and HYD captions, and

R r4) check that the two green solenoid selector lamps are lit.

R (s) At the flying controls relay jacks panel, set the selector switch to "GREEN ONLY".

R (t) At the ground hydraulics check-out panel, set the hydraulic selector to "BLUE-YELLOW".
R Allow at least 1 min to elapse, to ensure that
R the green hydraulic system is depressurised
R before proceeding with the next operation.

R (u) Set Nos.3 and 4 intakes RAMP - SPILL MASTER switches to "AUTO" and Nos.1 and 2 intakes RAMP - SPILL MASTER switches to "MAN". Check that Nos.1 and 2 INT failure captions are illuminated, accompanied by the MWS red captions; press-to-cancel the MWS red INT captions.

R (v) Start the test program by setting the CONTINUE - OFF switch on the AITP to "CONTINUE". Check that the HOLD caption is extinguished and remains extinguished, and that after approximately 5 min the N1 REQD caption is illuminated.

NOTE: Illumination of the N1 REQD caption, provided that the HOLD caption has not been re-illuminated during the test program, indicates the successful completion of the Preliminary Test on all four intakes. The GO caption can be illuminated only on the successful completion of the N1 probe checks, which require all engines to be running.

Illumination of the HOLD caption during the test, accompanied by the appropriate equipment failure caption and a binary address display, indicates that a failure has been detected and that the test sequence has stopped
R (Ref. 71-00-39, Trouble Shooting).
The test sequence can be continued by resetting the CONTINUE - OFF
R switch to "CONTINUE".

The RESET switch on the AITP allows the test program to be reset to the

beginning at any time during the test sequence.

(3) Conclusion

(a) Set the intake test ON - OFF switch to "OFF" and close and wire-lock the switch guard in accordance with 20-21-13. Check that the ON caption is extinguished.

(b) Set the RAMP-SPILL MASTER switches for intakes 1 and 2 to "AUTO".

(c) Set the AICS GROUND-FLIGHT switches to "FLIGHT" and position the switch guards to maintain the switches at the "FLIGHT" position.

(d) Press the MWS RECALL push-switch and check that the MWS red INT captions remain extinquished.

(e) Set Nos. l,2, 3 and 4 intakes RAMP-SPILL MASTER switches to "MAN". Press-to-cancel the red MWS INT failure captions

(f) At the ground hydraulics check-out panel set the hydraulic pump switches PUMP 1 G-Y and PUMP 2 B-Y to "OFF".

(g) At the flying controls servo controls hydraulic selection panel, set the upper switch to "NORMAL".

(h) At the flying controls relay jacks panel, set the selector switch to "NORM".

(i) Remove safety clip and reset the following circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
PFC IND	1-213	C287	N18

After SB 27-043 For A/C 001-007,

R (i) Remove safety clips and reset the following circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
YELL L/L PFC & RELAY JACK 'A' SYS CONT	1-213	C288	P18
YELL L/L PFC & RELAY JACK 'B' SYS CONT	3-213	C282	A 8

R (j) Switch off and disconnect electrical ground power as detailed in 24-41-00.

R (k) Remove all barriers and warning placards.

AIR INTAKE CONTROL UNIT - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Eight air intake control units (AICUs) are housed in 1/2 ATR long cases in the rear vestibule racking. The units are designated Nos.1 to 8 inclusive and are mounted on shelves 4-243 (Nos.2 and 3), 5-243 (Nos.1 and 4), 4-244 (Nos.5 and 8) and 5-244 (Nos.6 and 7).

2. Control Unit

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare

(1) Electrically isolate the air intake test panel by tripping the following circuit breaker. Fit a safety clip.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
TEST PNL SUP	15-216	K1755	C 8

(2) Electrically isolate the appropriate control panel by tripping the following associated circuit breakers. Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
NO.1A CONTROL UNIT			
AICU 1A SUP	2-213	1K2050	D14

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
SENSOR UNIT 1 SUP	2-213	1K2052	A14
INT 1 MAIN HYD SUP	1-213	1K1950	D 9
NO.1B CONTROL UNIT			
AICU 1B SUP	14-216	1K2051	A 5
SENSOR UNIT 4 SUP	14-216	4K2052	C 5
INT 1 STBY HYD SUP	15-216	1K1960	B 8
NO.2A CONTROL UNIT			
AICU 2A SUP	13-216	2K2050	A 3
SENSOR UNIT 2 SUP	13-216	2K2052	B 4
INT 2 MAIN HYD SUP	15-215	2K1950	B18
NO.2B CONTROL UNIT			
AICU 2B SUP	2-213	2K2051	H14
SENSOR UNIT 3 SUP	2-213	3K2052	G14
INT 2 STBY HYD SUP	1-213	2K1960	E 9
NO.3A CONTROL UNIT			
AICU 3A SUP	2-213	3K2050	H13
SENSOR UNIT 3 SUP	2-213	3K2052	G14
INT 3 MAIN HYD SUP	5-213	3K1950	A 7
NO.3B CONTROL UNIT			
AICU 3B SUP	13-216	3K2051	B 3
SENSOR UNIT 2 SUP	13-216	2K2052	B 4
INT 3 STBY HYD SUP	15-215	3K1960	C18
NO.4A CONTROL UNIT			
AICU 4A SUP	14-216	4K2050	B 5
SENSOR UNIT 4 SUP	14-216	4K2052	C 5
INT 4 MAIN HYD SUP	15-216	4K1950	A 8
NO.4B CONTROL UNIT			
AICU 4B SUP	2-213	4K2051	B14
SENSOR UNIT 1 SUP	2-213	1K2052	A14
INT 4 STBY HYD SUP	5-213	4K1960	A 6

(3) Remove the appropriate cover from the rear vestibule racking and locate the control unit.

C. Remove

R (1) Loosen the clamping nut assemblies and remove them

from the unit hold-down hooks.

(2) Grasp both carrying handles and carefully withdraw the unit from the backplate connectors and remove it from the shelf.

(3) Fit a suitable blank to cover the exposed airflow metering plate on the rack (Ref. 21-21-00, Servicing).

CAUTION: AFTER REMOVAL OF AN AICU, IF THE AICS IS OPERATED WITHOUT A SUITABLE BLANK FITTED TO THE SHELF, EXCESSIVE LOSS OF COOLING AIR WILL RESULT IN OVERHEATING OF EQUIPMENT ON THAT SHELF.

D. Install

(1) Comply with the electrical safety precautions.

(2) Remove the blank fitted in operation C.(3).

R B NOTE: Pre-mod and post mod.1772 (thin lip intake)
R B AICUs are functionally and physically non-
R B interchangeable. Ensure that the unit to
R B be fitted to the aircraft is to the correct
R B standard as follows:
R B Aircraft pre mod.1772 - AICU
R B Pt.No.EAU010 460
R B Aircraft post-mod.1772 - AICU
R B Pt.No.EAU010 469

(3) Remove the protective covers from the backplate connectors and ensure that all pins, inserts and mating surfaces are clean and undamaged.

(4) Place the unit on the shelf runners and carefully push the unit backward until fully engaged with the backplate connectors. Ensure that the unit is bonded in accordance with 20-27-11.

(5) Engage the clamping nut assemblies with the unit hold-down hooks and tighten the nuts, using hand pressure only. The unit must be sufficiently secure to prevent sideways movement, but not so tight that deflection of the backplate occurs.

E. Conclusion

(1) Refit and secure the cover to the rack.

(2) Remove the safety clips and reset the circuit breakers

tripped before removal.

(3) Carry out an Operational Test of the air intake control system (AICS) as detailed in 71-61-18, Adjustment/Test, '2. Operational Test - Test Unit (AITU), Sensor UNIT (AISU) or Control Unit (AICU)'.

MANUAL CONTROL PANEL - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General (Ref. Fig. 401)

The manual control panel (MCP) is situated on the left-hand side of the third crew member's (3CM) management panel and is front-mounted. Releasing four quick-release fasteners enables the MCP to be partially withdrawn, allowing
R access to the electrical connectors which can then be discon-
R nected to permit the complete removal of the control panel.

The following procedures provide for the removal/installation of a complete MCP or an individual position indicator, as required.

2. Manual Control Panel

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare to Remove Panel

R R (1) Electrically isolate the panel by tripping the following circuit breakers. Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
INT 3 MAIN HYD SUP	5-213	3K1950	A7

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
R 3CM STN INST LTS SUP	13-216	L377	E7
3CM STN PNL LTS SUP	14-216	L86	D9
INT 1 RAMP & SPILL POSN IND	2-213	1E541	E14
INT 2 RAMP & SPILL POSN IND	4-213	2E541	E17
INT 3 RAMP & SPILL POSN IND	4-213	3E541	F17
INT 4 RAMP & SPILL POSN IND	2-213	4E541	F14

C. Remove Panel

(1) Release the quick-release fasteners and partially withdraw the panel.

(2) Disconnect the electrical connectors and remove the panel.

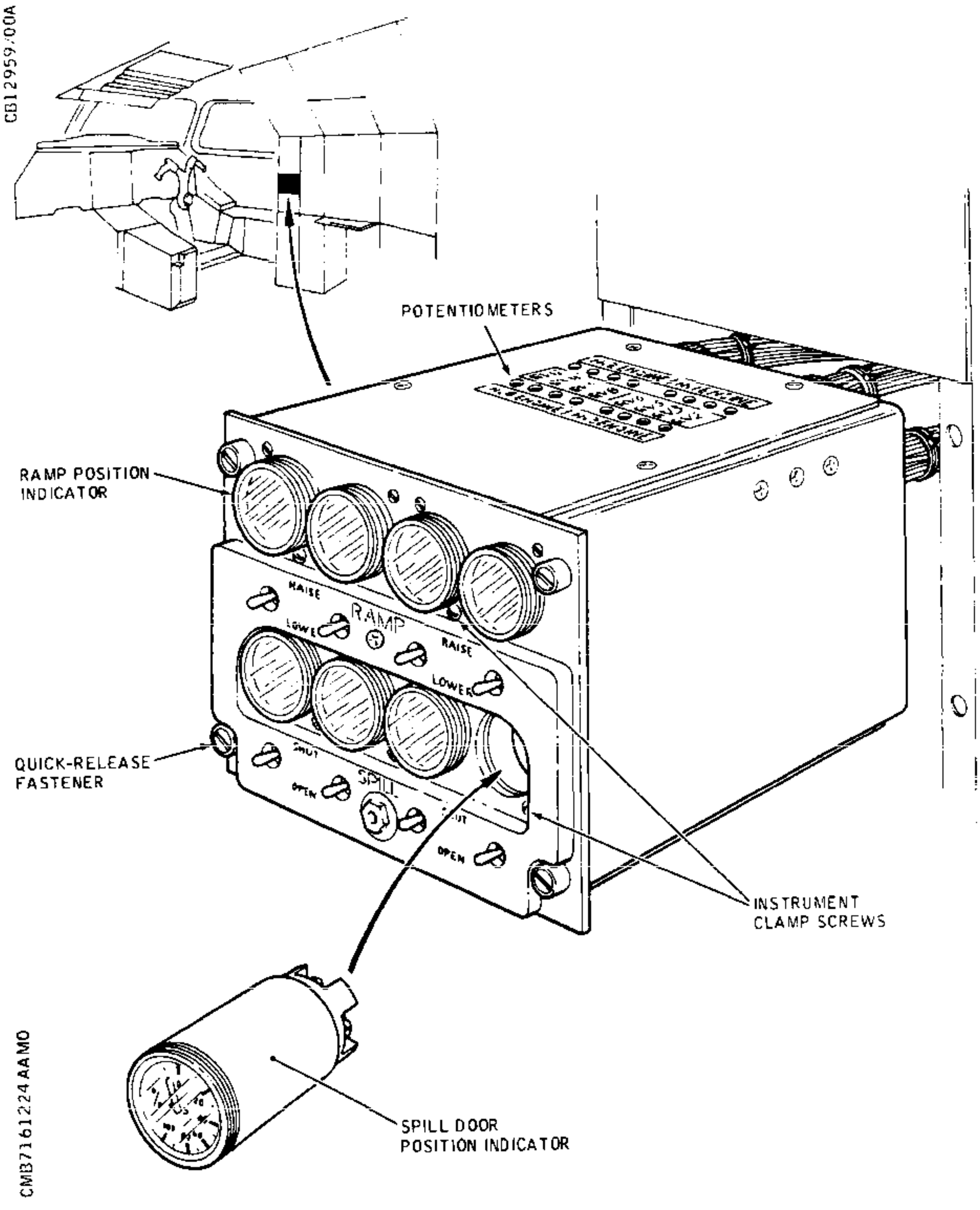
D. Install Panel

(1) Comply with the electrical safety precautions.

(2) Support the panel and connect the electrical connectors to the panel, ensuring that the mating surfaces are clean and undamaged.

(3) Position the cable assemblies to prevent trapping, then fully insert the panel and secure it with the quick-release fasteners.

E. Conclusion



- Manual Control Panel and Position Indicator -
Installation
Figure 401

R

(1) Remove the safety clips and reset circuit breakers L86 and L377, only.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Check the panel and integral lighting as follows:-

(a) Switch on the PANEL lighting control switch (Ref. 33-17-00) on panel 11-214. Check that the integral lighting in each indicator illuminates the scale; return the switch to the 'off' position.

(b) Switch on the PANEL lighting control switch (Ref. 33-16-00) on the panel lighting control panel 11-214. Check that the electroluminescent panel engravings are illuminated; return the switch to the 'off' position.

(4) Carry out a Functional Test of the system as detailed in Adjustment/Test.

(5) Switch off and disconnect electrical ground power as detailed in 24-41-00.

3. Position Indicator (Ramp or Spill)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare to Remove Indicator

(1) Electrically isolate the indicator by tripping the appropriate circuit breakers listed below. Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Intake 1 (ramp or spill position indicator)			

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
3CM STN INST LTS SUP	13-216	L377	E 7
INT 1 RAMP & SPILL POSN IND	2-213	1E541	E14
<u>Intake 2 (ramp or spill position indicator)</u>			
3CM STN INST LTS SUP	13-216	L377	E 7
INT 2 RAMP & SPILL POSN IND	4-213	2E541	E17
<u>Intake 3 (ramp or spill position indicator)</u>			
3CM STN INST LTS SUP	13-216	L377	E 7
INT 3 RAMP & SPILL POSN IND	4-213	3E541	F17
<u>Intake 4 (ramp or spill position indicator)</u>			
3CM STN INST LTS SUP	13-216	L377	E 7
INT 4 RAMP & SPILL POSN IND	2-213	4E541	F14

C. Remove Indicator

(1) Slacken the associated instrument clamp screw of the indicator to be removed.

(2) Grasp the indicator bezel ring and withdraw the instrument through the front of the mounting panel.

(3) Disconnect the electrical cables from the rear of the indicator. Identify each cable to facilitate reconnection.

D. Install Indicator

(1) Comply with the electrical safety precautions.

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(2) Connect the electrical cables to the indicator, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(3) Insert the indicator into the instrument clamp in the mounting panel.

(4) Align the indicator in the panel, then tighten the instrument clamp screw.

E. Conclusion

(1) Remove the safety clips and reset the circuit breakers tripped before removal.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Switch on the PANEL lighting control switch (Ref. 33-17-00) on panel 11-214. Check that the instrument integral lighting illuminates the scale; return the switch to the 'off' position.

(4) Carry out a Functional Test of the indicator as detailed in Adjustment/Test.

(5) Switch off and disconnect electrical ground power as detailed in 24-41-00.

MANUAL CONTROL PANEL - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

1. General

This topic comprises two Functional Tests, one for a complete manual control panel (MCP), the other for an individual position indicator.

In addition, the setting procedure is given for correlating each ramp and spill door fully up and fully down position with the 0 per cent and 100 per cent graduations respectively, on the associated position indicator.

Operational and System Tests are not applicable in this instance.

R B CAUTION: AN INSULATED BLADED SCREWDRIVER MUST BE USED
R B WHEN ADJUSTING THE RANGE POTENTIOMETERS.
R B
R B Note: A metal cal label carrying a warning of the above
R B must be attached to the top surface of the manual
R B control panel.

2. Functional Test - Manual Control Panel

A. Prepare to Test Panel

(1) Ensure that the four intakes and the areas below the spill doors are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes.

(3) Display placards, warning of ramp and spill door operation, in the ramp and spill door areas.

(4) Make available electrical ground power as detailed in 24-41-00.

(5) Pressurize the main (green and blue) and standby (yellow) hydraulic systems (Ref. Chap.29); ensure that the hydraulic operating pressures are normal.

(6) At the auto control panel (ACP) -

(a) select the green hydraulic system for intakes 1 and 2 and the blue system for intakes 3 and 4, and

(b) set the four RAMP - SPILL MASTER switches to "AUTO".

(7) If necessary, e.g., after MCP removal and installation, remove the safety clips and reset the following circuit breakers:-

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
INT 1 RAMP & SPILL POSN IND	2-213	1E541	E14
INT 2 RAMP & SPILL POSN IND	4-213	2E541	E17
INT 3 RAMP & SPILL POSN IND	4-213	3E541	F17
INT 4 RAMP & SPILL POSN IND	2-213	4E541	F14

B. Test Panel

(1) At the ACP, set the four RAMP - SPILL MASTER switches to "MAN", in turn. After each setting has been made check that the associated ramp and spill door do not move.

(2) Press-to-cancel the red INT captions on the master warning display panel (Ref. 33-15-00).

(3) At the MCP, set No. 1 intake RAMP inching switch to "RAISE" and check that the No.1 RAMP position indicator displays 0 per cent with the ramp in the fully up position.

(4) If necessary, release the MCP to gain access to the ramp position indicator zeroing potentiometer, No. 1 ENGINE RV2. Adjust as necessary to align the indicator pointer with the 0 per cent graduation on the scale.

(5) Set No.1 intake RAMP inching switch to "LOWER". Check that when the ramp reaches the fully down position the ramp position indicator displays 100 per cent.

(6) If necessary, release the MCP to gain access to the ramp position indicator full scale adjusting potentiometer, No.1 ENGINE RV3. Adjust as necessary to align the indicator pointer with the 100 per cent graduation on the scale.

(7) Set No.1 intake RAMP inching switch to "RAISE". Recheck that the ramp position indicator displays 0 per cent when the ramp reaches the fully up position. If necessary, readjust the potentiometer until the indicator reading is correct, then repeat operations (5) and (6). Repeat this process until the indicator reading is correct at 0 per cent and 100 per cent (this procedure is necessary because of interaction between the two trim potentiometers).

(8) Repeat operations (3), (4), (5), (6) and (7), as applied to -

(a) intake 2 in conjunction with No.2 ENGINE potentiometers RV8 and RV9,

(b) intake 3 in conjunction with No.3 ENGINE potentiometers RV2 and RV3, and

(c) intake 4 in conjunction with No.4 ENGINE potentiometers RV8 and RV9.

(9) At the ACP, set the four hydraulic select switches to "YELLOW".

(10) At the MCP, operate each ramp inching switch,

in turn. Check that each ramp operates over its full range; return the ramps to the fully up position.

(11) At the ACP, select the green hydraulic system for intakes 1 and 2 and the blue system for intakes 3 and 4.

(12) Set No.1 intake SPILL inching switch to "SHUT" and check that the No.1 intake SPILL door position indicator displays 0 per cent with the spill door in the fully closed position.

(13) If necessary, release the ACP to gain access to the spill door position indicator zeroing potentiometer, No.1 ENGINE RV5. Adjust as necessary to align the indicator pointer with the 0 per cent graduation on the scale.

(14) Set No.1 intake SPILL inching switch to "OPEN". Check that when the spill door reaches the fully down position the SPILL door position indicator displays 100 per cent.

(15) If necessary, release the MCP to gain access to the spill door position indicator full scale adjusting potentiometer, No.1 ENGINE RV6. Adjust as necessary to align the indicator pointer with the 100 per cent graduation on the scale.

(16) Set No.1 intake SPILL inching switch to "SHUT". Recheck that the SPILL door position indicator displays 0 per cent when the spill door reaches the fully closed position. If necessary, readjust the potentiometer until the indicator reading is correct, then repeat operations (14) and (15). Repeat this process until the indicator reading is correct at 0 per cent and 100 per cent.

(17) Repeat operations (12), (13), (14), (15) and (16), as applied to -

(a) intake 2 in conjunction with No.2 ENGINE potentiometers RV11 and RV12,

(b) intake 3 in conjunction with No.3 ENGINE potentiometers RV5 and RV6, and

(c) intake 4 in conjunction with No.4 ENGINE potentiometers RV11 and RV12.

(18) At the ACP, set the four hydraulic select switches to "YELLOW".

(19) At the MCP, operate each RAMP and SPILL inching switch, in turn. Check that each ramp and spill door operates; return the ramps to the fully up position and the spill doors to the fully closed position.

C. Conclusion

(1) Depressurize the green, blue and yellow hydraulic systems (Ref. Chap.29) and set the hydraulic select switches on the ACP to "AUTO".

(2) Ensure that the MCP is correctly positioned and secured.

(3) Remove all barriers and warning placards.

(4) Switch off and disconnect electrical ground power as detailed in 24-41-00.

3. Functional Test - Position Indicator (Ramp or Spill)

A. Prepare to Test Indicator (Ramp or Spill)

(1) Make available electrical ground power as detailed in 24-41-00.

(2) Ensure that the four intakes and the areas below the spill doors are clear of persons and equipment.

(3) Position barriers to prevent persons from inadvertently entering the area below the spill doors, and position barriers (e.g., nets) over the appropriate intake entry to prevent persons from entering the intake.

(4) Display placards, warning of ramp and spill door operation, in the ramp and spill door areas.

(5) Pressurize the required main (green Nos.1 and 2 intakes or blue Nos.3 and 4 intakes) hydraulic system (Ref. Chap.29); ensure that the hydraulic operating pressure is normal.

(6) At the auto control panel (ACP), select the hydraulic system required: the green system for intakes 1 and 2 or the blue system for intakes 3 and 4.

B. Test Ramp Position Indicator

(1) At the ACP, set the associated intake RAMP - SPILL MASTER switch to "MAN".

(2) Press-to-cancel the red INT caption on the master warning display panel (Ref. 33-15-00).

(3) At the MCP, set the associated intake RAMP inching switch to "RAISE" and check that the RAMP position indicator displays 0 per cent when the ramp is in the fully up position.

(4) If necessary, release the MCP to gain access to the associated ramp position indicator zeroing potentiometer, No.1 ENGINE RV2, No.2 ENGINE RV8, No.3 ENGINE RV2 or No.4 ENGINE RV8, as applicable. Adjust as necessary to align the indicator pointer with the 0 per cent graduation on the scale.

(5) Set the associated intake RAMP inching switch to "LOWER". Check that the RAMP position indicator displays 100 per cent when the ramp is fully down.

(6) If necessary, release the MCP to gain access to the associated ramp position indicator full scale adjusting potentiometer, No.1 ENGINE RV3, No.2 ENGINE RV9, No.3 ENGINE RV3 or No.4 ENGINE RV9, as applicable. Adjust as necessary to align the indicator pointer with the 100 per cent graduation on the scale.

(7) Set the associated intake RAMP inching switch to "RAISE". Recheck that the RAMP position indicator displays 0 per cent when the ramp is fully up. If necessary, readjust the potentiometer until the indicator reading is correct, then repeat operations (5) and (6). Repeat this process until the indicator reading is correct at 0 per cent and 100 per cent (this procedure is necessary because of interaction between the two trim potentiometers).

C. Test Spill Door Position Indicator

(1) At the ACP, set the associated RAMP - SPILL MASTER switch to "MAN".

(2) Press-to-cancel the red INT caption on the master warning display panel (Ref. 33-15-00).

(3) At the MCP, set the associated intake SPILL inching

switch to "SHUT". Check that the spill door position indicator displays 0 per cent when the spill door is in the fully closed position.

(4) If necessary, release the MCP to gain access to the associated spill door position indicator zeroing potentiometer, No.1 ENGINE RV5, No.2 ENGINE RV11, No.3 ENGINE RV5 or No.4 ENGINE RV11, as applicable. Adjust as necessary to align the indicator pointer with the 0 per cent graduation on the scale.

(5) Set the associated intake SPILL inching switch to "OPEN". Check that the SPILL door position indicator displays 100 per cent when the spill door reaches the fully open position.

(6) If necessary, release the MCP to gain access to the associated spill door position full scale adjusting potentiometer, No.1 ENGINE RV6, No.2 ENGINE RV12, No.3 ENGINE RV6 or No.4 ENGINE RV12, as applicable. Adjust as necessary to align the indicator pointer with the 100 per cent graduation on the scale.

(7) Set the associated intake SPILL inching switch to "SHUT". Recheck that the SPILL door position indicator displays 0 per cent when the spill door is fully closed. If necessary, readjust the potentiometer until the indicator reading is correct, then repeat operations (5) and (6). Repeat this process until the indicator reading is correct at 0 per cent and 100 per cent.

D. Conclusion

(1) Depressurize the hydraulic system in use (Ref. Chap.29), and set the hydraulic select switches on the ACP to "AUTO".

(2) Ensure that the MCP is correctly positioned and secured.

(3) Remove all barriers and warning placards.

(4) Switch off and disconnect electrical ground power as detailed in 24-41-00.

INTERFACE UNIT AND COMPONENT BOARDS - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General (Ref. Fig. 401)

Interface units situated in the left- and right-hand rear equipment racks contain removable plug-in component boards (Ref. Fig. 401). The interface units are not normally removed from the aircraft and access at the rear of each unit is provided to enable the component board(s) to be removed with the interface units in situ.

Removal of the appropriate bulkhead panel at the back of the left- and right-hand equipment racks allows access to the interface units.

Releasing a quick-release fastener situated at the rear of the interface unit enables a hinged cover plate to be raised to gain access to the component boards. A label designating the location of the component boards within the interface unit is attached to the inner surface of the cover plate.

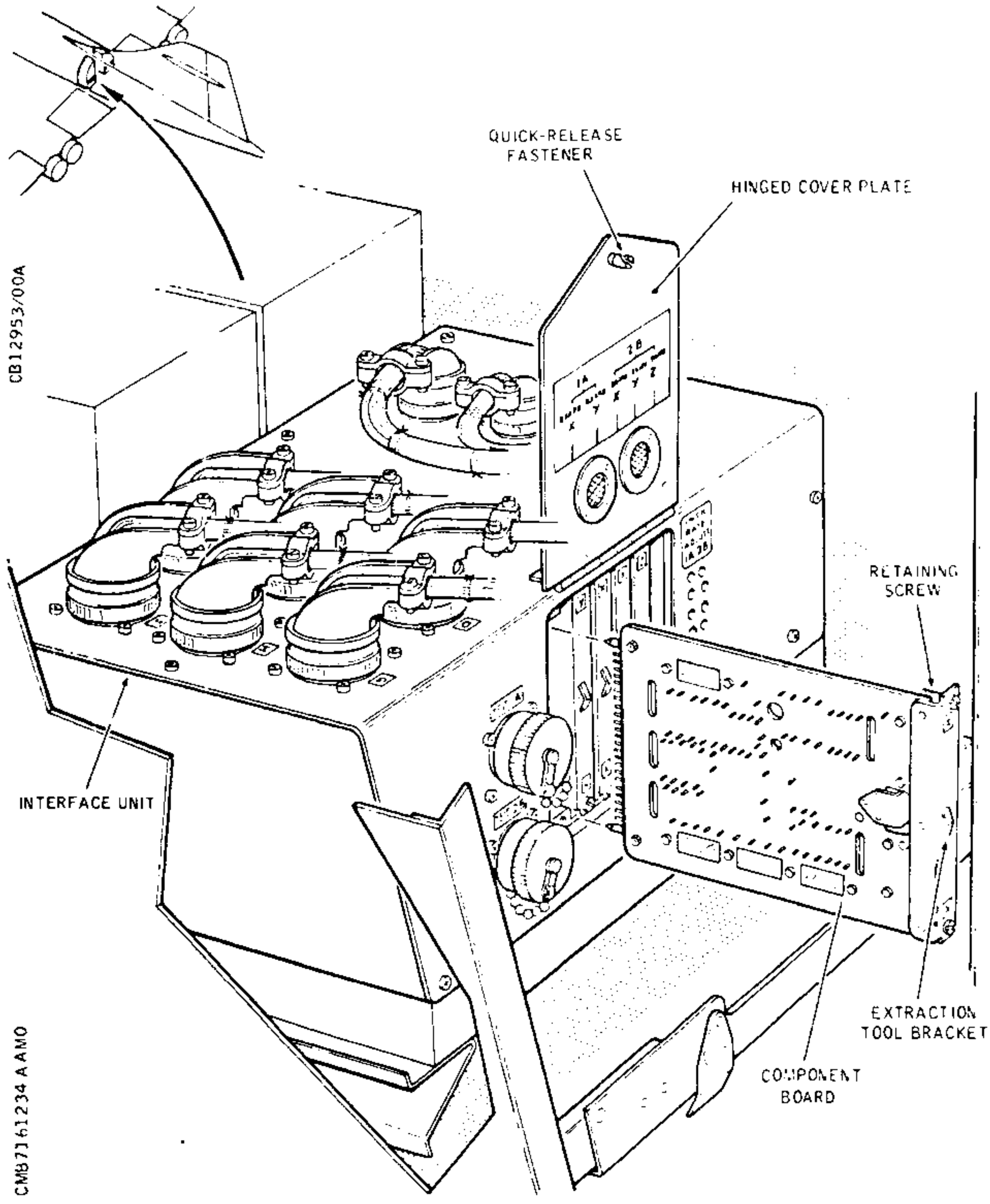
Guide-ways position component boards within the interface unit and two captive screws retain each board in position. A special extraction tool is available for the withdrawal of the component boards.

There are three types of component board, designated X, Y and Z, each board having a unique connector keyway to prevent inadvertent insertion into an incorrect location.

R B NOTE: (BA Alert 71-578)
R B IPC 71-61-10, page 28-0, refers to two pairs of relays RL1 and RL2, RL3 and RL4. RL1 and RL2 are identical, both P/N 14767, code 66.250.077.00. RL3 and RL4 are identical, both P/N 2065-05, code 66.250.286.00. Relay RL2 is referred to as P/N 425-261-003-0 which is identical to P/N 14767.

R B If RL3 and RL4 relays are fitted incorrectly to relay positions RL1 and RL2 no supply will be available to the ignition reheat transformer and, as such, the reheat system fails.

R B This is issued to draw attention to the fact that physically,RL1, RL2, RL3 and RL4 can at present be fitted in any position but, as above, only those part numbers concerned may be fitted in the correct relay position.



Interface Unit and Component Boards
Figure 401

2. Component Board (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clip	-
Component board extraction tool	A640700J010

B. Prepare

(1) Electrically isolate the component board(s) by tripping those circuit breakers listed below which are associated with the appropriate interface unit(s). Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
No.1 interface unit			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
AICU 1A SUP	2-213	1K2050	D14
INT 2 STBY HYD SUP	1-213	2K1960	E9
AICU 2B SUP	2-213	2K2051	H14
INTERFACE UNIT 1A/2B SUP	1-213	1K1976	K9
No.2 interface unit			
INT 1 STBY HYD SUP	15-216	1K1960	B8
AICU 1B SUP	14-216	1K2051	A5
INT 2 MAIN HYD SUP	15-215	2K1950	B18
AICU 2A SUP	13-216	2K2050	A3
INTERFACE UNIT 2A/1B SUP	15-215	2K1976	D18
No.3 interface unit			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
AICU 3A SUP	2-213	3K2050	H13
INT 4 STBY HYD SUP	5-213	4K1960	A6
AICU 4B SUP	2-213	4K2051	B14
INTERFACE UNIT 3A/4B SUP	5-213	3K1976	D6

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
No.4 interface unit			
INT 3 STBY HYD SUP	15-215	3K1960	C18
AICU 3B SUP	13-216	3K2051	B3
INT 4 MAIN HYD SUP	15-216	4K1950	A8
AICU 4A SUP	14-216	4K2050	B5
INTERFACE UNIT 4A/3B SUP	15-216	4K1976	D8

(2) Remove the appropriate bulkhead panel at the back of the left- or right-hand rear equipment racking and locate the required interface unit.

C. Remove

(1) Release the quick-release fastener retaining the hinged cover plate at the rear of the interface unit. Raise the cover plate to gain access to the component boards.

(2) Locate the appropriate component board and release the two captive retaining screws.

(3) Attach the extraction tool to the bracket on the front panel of the component board and carefully withdraw the board.

D. Install

(1) Comply with the electrical safety precautions.

(2) Remove the protective cover from the component board connector and ensure that all pins, inserts and mating surfaces are clean and undamaged.

(3) Check that the replacement component board is compatible with the extracted board.

(4) Ensure correct annotation of the component board and position it in the appropriate guide-ways in the interface unit.

(5) Fully insert the component board and secure it in position by the two front panel captive retaining screws.

(6) Replace and secure the hinged panel at the rear of the interface unit.

E. Conclusion

(1) Remove the safety clips and reset the circuit breakers tripped before removal of the component board(s).

(2) Carry out the appropriate Preliminary Test as detailed in 71-61-00, Adjustment/Test, '3. Operational Test (Excluding Ramp Manual Inching, Spill Door Manual Inching and Auxiliary Inlets)'.

(3) Test the reheat system as detailed in 76-15-00, Adjustment/Test, '2. Reheat Test Set use in Automatic Mode'.

NOTE: This test is applicable to No.2 and No.3 interface units only.

(4) Replace the removed bulkhead panel(s) of the equipment racking.

PRESSURE RATIO ERROR INDICATOR AND POTENTIOMETER - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General (Ref. Fig. 401)

Four pressure ratio error indicators are front-mounted in an intake pressure ratio error panel, each indicator being retained by an instrument clamp; an associated adjustment potentiometer is mounted directly behind each indicator.

The intake pressure ratio error indicator panel (35-214) is situated on the left-hand side of the third crew member's management panel. Releasing four quick-release fasteners enables the panel to be partially withdrawn, allowing access to the pressure ratio error indicator connections and adjustment potentiometer.

This topic includes separate procedures for the removal/ installation of individual indicators or potentiometers and for the removal of the complete panel.

2. Pressure Ratio Error Indicator

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare to Remove Indicator

R (1) Electrically isolate the panel by tripping the
R following circuit breakers. Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
AICU 1A SUP	2-213	1K2050	D14
AICU 2A SUP	13-216	2K2050	A3
AICU 3A SUP	2-213	3K2050	H13

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
AICU 4A SUP	14-216	4K2050	B5
AICU 1B SUP	14-216	1K2051	A5
AICU 2B SUP	2-213	2K2051	H14
AICU 3B SUP	13-216	3K2051	B3
AICU 4B SUP	2-213	4K2051	B14
R 3CM STN INST LTS SUP	13-216	L377	E7
3CM STN PNL LTS SUP	14-216	L86	D9

C. Remove Indicator

(1) Release the four quick-release fasteners and partially withdraw the panel to gain access to the indicators.

(2) Slacken the associated instrument clamp screw of the indicator to be removed.

(3) Disconnect the electrical cables from the rear of the indicator. Identify each cable to facilitate reconnection.

(4) Withdraw the indicator through the front panel.

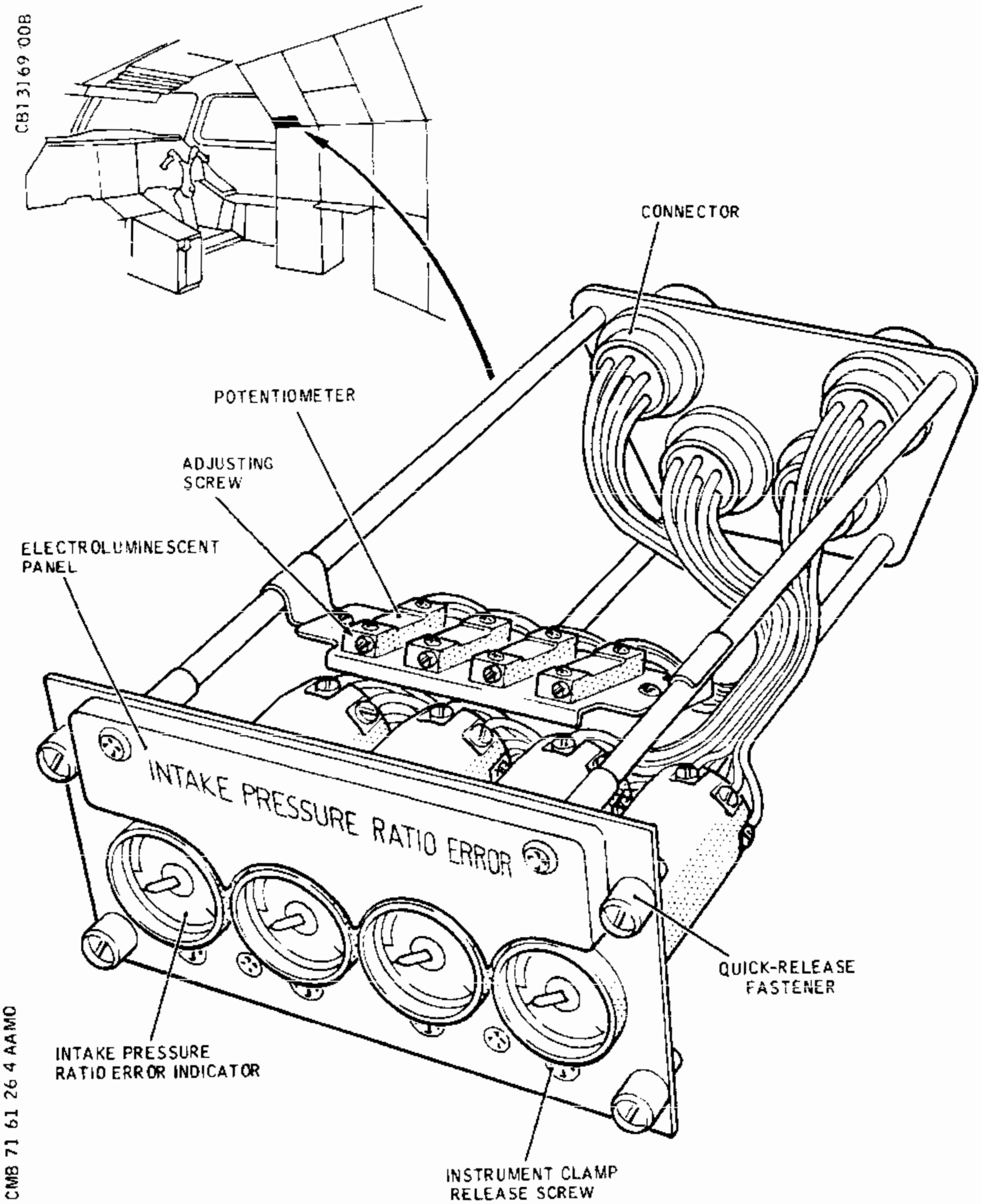
D. Install Indicator

(1) Comply with the electrical safety precautions.

(2) Insert the indicator into the instrument clamp.

(3) Connect the electrical cables to the indicator, ensuring that the connections are made in accordance with the cable identification and the applicable wiring diagram.

(4) Align the indicator in the panel, then tighten the instrument clamp screw. Temporarily secure the panel.



- Pressure Ratio Error Indicator and Potentiometer -
Installation
Figure 401

R

E. Conclusion

(1) Remove the safety clips and reset the circuit breakers tripped before removal.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Check that the pointer on the indicator is aligned with the centre white scale mark (twelve o'clock position). If necessary, adjust the associated potentiometer, located directly behind the indicator, to obtain this condition.

(4) Position the connecting cable assemblies to prevent trapping, then fully insert the panel and secure it with the quick-release fasteners.

(5) Switch on the PANEL lighting control switch (Ref. 33-17-00) on panel 11-214. Check that the integral lighting in the indicator illuminates the scale; return the switch to the 'off' position.

(6) Switch off and disconnect electrical ground power as detailed in 24-41-00.

3. Potentiometer

A. Prepare to Remove Potentiometer

(1) Electrically isolate the panel by tripping all the circuit breakers listed in paragraph 2.B.(1). Fit a safety clip to each tripped circuit breaker.

B. Remove Potentiometer

(1) Release the four quick-release fasteners and partially withdraw the panel to gain access to the electrical connectors.

(2) Disconnect the electrical connectors and remove the panel.

(3) Unsolder the electrical cables from the potentiometer in accordance with Wiring Diagram Manual, 20-42-23, release the retaining screws and remove the potentiometer from the panel.

C. Install Potentiometer

(1) Comply with the electrical safety precautions.

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(2) Secure the potentiometer to the panel with the retaining screws and solder the electrical cables in accordance with Wiring Diagram Manual, 20-42-23, to the potentiometer, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(3) Support the panel and connect the electrical connectors to it, ensuring that the mating surfaces are clean and undamaged, and that the connector identifications correspond. Temporarily secure the panel.

D. Conclusion

(1) Remove the safety clips and reset the circuit breakers tripped before removal.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Adjust the potentiometer to align the pressure ratio error indicator pointer with the centre white scale mark (twelve o'clock position).

(4) Position the cable assemblies to prevent trapping, then fully insert the panel and secure it with the four quick-release fasteners.

(5) Switch on the PANEL lighting control switch (Ref. 33-17-00) on panel 11-214. Check that the integral lighting in each indicator illuminates the scale; return the switch to the 'off' position.

R (6) Switch on the PANEL lighting control switch (Ref. 33-16-00) on the panel lighting control panel 11-214. Check that the electroluminescent panel engravings are illuminated; return the switch to the 'off' position.

(7) Switch off and disconnect electrical ground power as detailed in 24-41-00.

4. Pressure Ratio Error Panel

A. Prepare to Remove Panel

(1) Electrically isolate the panel by tripping all the circuit breakers listed in paragraph 2.B.(1). Fit a safety clip to each tripped circuit breaker.

B. Remove Panel

(1) Release the four quick-release fasteners and partially withdraw the panel to gain access to the electrical connectors.

(2) Disconnect the electrical connectors and remove the panel.

C. Install Panel

(1) Comply with the electrical safety precautions.

(2) Support the panel and connect the electrical connectors to it, ensuring that the mating surfaces are clean and undamaged, and that the connector identifications correspond. Temporarily secure the panel.

D. Conclusion

(1) Remove the safety clips and reset the circuit breakers tripped before removal.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Check that the pointer on each indicator is aligned with the centre white scale mark (twelve o'clock position). If necessary, adjust the associated potentiometers, located directly behind the indicators, to obtain this condition.

(4) Position the connecting cable assemblies to prevent trapping, then fully insert the panel and secure it with the quick-release fasteners.

(5) Switch on the PANEL lighting control switch (Ref. 33-17-00) on panel 11-214. Check that the integral lighting in each indicator illuminates the scale; return the switch to the 'off' position.

R (6) Switch on the PANEL lighting control switch (Ref. 33-16-00) on the panel lighting control panel 11-214. Check that the electroluminescent panel engravings are illuminated; return the switch to the 'off' position.

(7) Switch off and disconnect electrical ground power as detailed in 24-41-00.

115/26 V 400 Hz TRANSFORMER - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Eight 115/26 V 400 Hz transformers, one for each AICS control channel, are mounted in the rear equipment racking, four in zone 7-243 and four in zone 7-244. Access to the transformers is gained by removing the reheat control amplifier (Ref. 76-15-11) from shelves 4-243 and 4-244.

2. Transformer

A. Equipment and Materials

EQUIPMENT	PART NO.
Circuit breaker safety clip	-
Torque-limiting screwdriver 0-80 lbf in (0-0.90 mdaN)	
Torque spanner 0-44 lbf in (0-0.50 mdaN).	

B. Prepare

(1) Electrically isolate the appropriate group of transformers by tripping the four associated circuit breakers listed below. Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Transformers 1K1708, 1K1709, 2K1708 and 2K1709			
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
AICU 2A SUP	13-216	2K2050	A3

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
AICU 2B SUP	2-213	2K2051	H14
R Transformers 3K1708, 3K1709, 4K1708 and 4K1709			
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14

(2) Remove the appropriate cover from the rear equipment racking and locate the reheat control amplifier on shelf 4-243 or 4-244.

R (3) Remove the reheat control amplifier (Ref. 76-15-11, Removal/Installation), and locate the transformers on the sidewall structure.

C. Remove

(1) Remove the six bolts and washers retaining the transformer brackets to the sidewall structure, taking note of the position of the P-clips retaining the cable assemblies. Withdraw the transformers and mounting brackets, complete with the cable assemblies, to the front of the shelf.

(2) Disconnect the cables from the transformer to be renewed. Identify each cable to facilitate reconnection.

R (3) Remove the two screws and washers securing the transformer to the mounting bracket and remove the transformer.

D. Install

(1) Comply with the electrical safety precautions.

(2) Position the transformer on the mounting bracket and
R secure it in position with the two screws and
R washers. Torque-tighten each screw to between
R 71 and 80 lbf in (0.80 and 0.90 mdaN).

(3) Connect the electrical cables to the transformer, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(4) Position the transformer assemblies on the sidewall and secure them in position with the six securing bolts and washers, ensuring that the P-clips retaining the cable assemblies are correctly positioned and
R secured. Torque-tighten each bolt to between 35 and
R 44 lbf in (0.40 and 0.50 mdaN).

R (5) Ensure that the transformer is bonded in accordance
R with 20-27-11.

E. Conclusion

R (1) Refit the reheat control amplifier
R (Ref. 76-15-11, Removal/Installation).

(2) Refit and secure the cover to the rack.

(3) Remove the safety clips and reset the circuit breakers tripped before removal.

(4) Carry out a Preliminary Test of the system as detailed in 71-61-00, Adjustment/Test, '3.
R Operational Test (excluding Ramps Manual Inching,
R Spill Doors Manual Inching and Auxiliary Inlets)'.

R (5) Carry out a test of the reheat control system
R (Ref.76-15-11, Removal/Installation).

AIR INTAKE ABSOLUTE PRESSURE SENSOR - REMOVAL/INSTALLATION

WARNING: ACCESS THROUGH THE ENGINE INTAKE SPILL DOOR IS PROHIBITED AT ALL TIMES.

BEFORE ENTERING AN INTAKE:-

(1) ENSURE THAT ALL HYDRAULIC PRESSURE IS REMOVED FROM THE ASSOCIATED HYDRAULIC SYSTEMS AND THAT HYDRAULIC POWER CANNOT BE INADVERTENTLY APPLIED WHEN ANYONE IS IN THE INTAKE.

(2) ENSURE THAT ELECTRICAL POWER SUPPLIES ARE ISOLATED FROM THE INTAKE CONTROL SYSTEM AND THAT WARNING NOTICES HAVE BEEN PLACED ON THE INTAKE CONTROL PANEL AND THE ENGINE STARTING PANEL AT THE THIRD CREW MEMBER'S STATION.

WHEN WORKING IN AN INTAKE, ENSURE THAT SAFETY PINS HAVE BEEN FITTED TO THE SPILL DOOR MAIN AND STANDBY HYDRAULIC SELECTOR VALVES.

OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

R B CAUTION: DURING TROUBLE SHOOTING USING AIRCRAFT B.I.T.E. CHECK,
R B A NEW AIR INTAKE ABSOLUTE PRESSURE SENSOR MUST NOT BE
R B HUNG, BUT SECURED CORRECTLY TO PREVENT IT FOULING IN
R B THE RAMP DOOR.

R B NOTE: An alternative is to use Test Set TE 6055 set to look at
R B Monitor and Control Sensors BIT words directly off digital
R B highway.

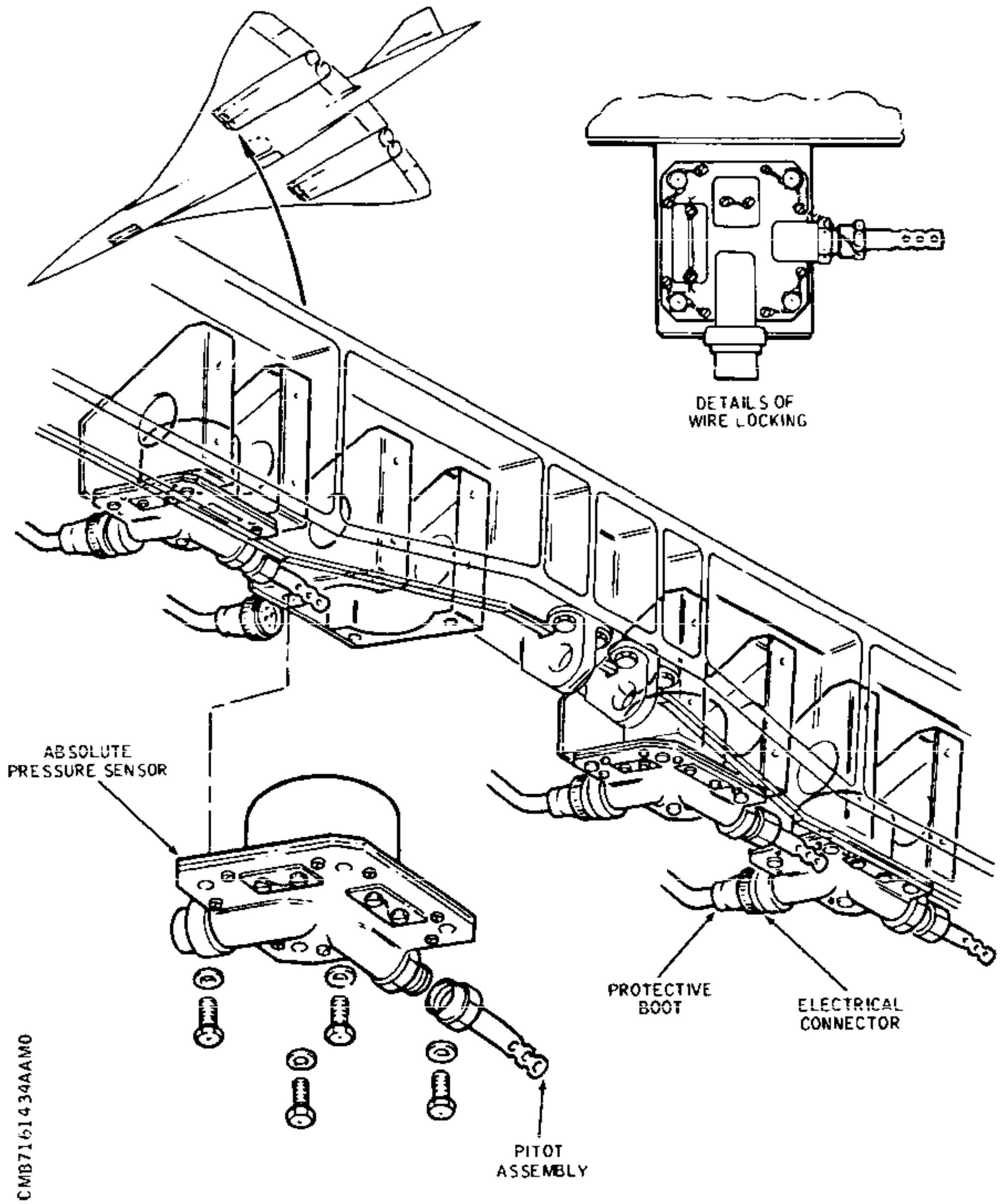
1. General

The air intake absolute pressure sensor units (APSUs), four per engine, are attached to the roof of the intake above the front section of the ramp. Each unit is electrically interconnected with the intake control system. The ramp must be lowered to gain access.

2. Absolute Pressure Sensor (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-



- Air Intake Absolute Pressure Sensors - Installation
Figure 401

B. Prepare

(1) Place notices conspicuously around the intake area forbidding entry by unauthorized persons.

(2) Lower the ramp, using the manual inching facility, as detailed in 71-61-00, Adjustment/Test.

(3) Isolate the hydraulic system as detailed in Chapter 29.

(4) Electrically isolate the appropriate sensor unit and the ramp and door control system by tripping the associated circuit breakers listed below. Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Intake 1			
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 STBY HYD SUP	15-216	1K1960	B8
Intake 2			
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 STBY HYD SUP	1-213	2K1960	E9
Intake 3			
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 STBY HYD SUP	15-215	3K1960	C18
Intake 4			
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 STBY HYD SUP	5-213	4K1960	A6

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.

(5) Display warning placards at the air intake management panel and the engine start panel at the third crew member (3CM) station to indicate that work is being carried out inside the intakes.

(6) Fit safety pins to the spill door main and standby selector valves as detailed in 71-62-12.

(7) Fit, and secure, the protective cover to the intake lip.

(8) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(9) Place the crawling board on the floor of the intake, aft of the servicing extension.

(10) Fit the cover to the engine transition ring.

C. Remove

CAUTION: A PERSON ENTERING INTAKES MUST WEAR RIGGING SHOES, FREE FROM LOOSE MATTER, AND MUST NOT LEAN WITH HIS FULL WEIGHT ON ANY INTAKE CONTROL SURFACE.

(1) Locate the absolute pressure sensors (four) in the intake roof above the forward ramp section.

(2) Pull back the protective boot and disconnect the electrical connector.

(3) Disconnect wire-locking, support the sensor and remove the four attachment bolts complete with washers. Remove the sensor.

(4) Remove the pitot assembly from the sensor and retain. Fit a blanking cap to the exposed port.

D. Install

(1) Comply with the electrical safety precautions.

(2) Remove the blanking cap from the sensor pitot port, then fit, correctly position (Ref. Fig. 401) and secure the pitot assembly retained in operation C.(4). Wire-lock with 22 s.w.g. steel wire (DTD 189) as detailed in 20-21-13.

(3) Remove the protective blank from the electrical connector and ensure that the pins, inserts and mating surfaces are clean and undamaged.

(4) Position the sensor in the support bracket and secure with bolts and washers. Wire-lock (Ref. Fig. 401) with 22 s.w.g. steel wire (DTD 189) as detailed in 20-21-13.

(5) Reconnect the electrical connector and reposition the protective boot.

E. Conclusion

(1) Remove all tools and equipment from the intake and ensure that the intake is clean and completely free from extraneous articles.

(2) Remove the safety pins from the main and standby spill door selector valves. Replace and secure the access panel.

(3) Remove the warning placards from the engine start panel and the air intake management panel.

(4) Remove the safety clips and reset the circuit breakers previously tripped.

CAUTION: THE INTAKE MUST BE CLEAR OF ALL EXTRANEOUS ARTICLES BEFORE RAMP/DOOR FUNCTION CHECKS ARE CARRIED OUT.

R (5) Carry out the appropriate Preliminary Test as detailed
R in 71-61-00, Adjustment/Test, '3. Operational Test
R (Excluding Ramp Manual Inching, Spill Door Manual
R Inching and Auxiliary Inlets)'.

AIR INTAKE HYDRAULIC SYSTEM - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)

**ON A/C 001-001,

(Ref. Fig. 002)

R **ON A/C 002-007,

(Ref. Fig. 003)

The air intake hydraulic system is that part of the aircraft hydraulic system which, in conjunction with the air intake control system (AICS) (Ref. 71-61-00), provides the means to operate the ramps and the spill door.

Each pair of intakes is supplied by a main system (green, for intakes 1 and 2; blue, for intakes 3 and 4), and a standby system (yellow) which is common to the four intakes.

The appropriate main system is cross-fed between its associated pair of intakes; the standby system is cross-fed between the four intakes.

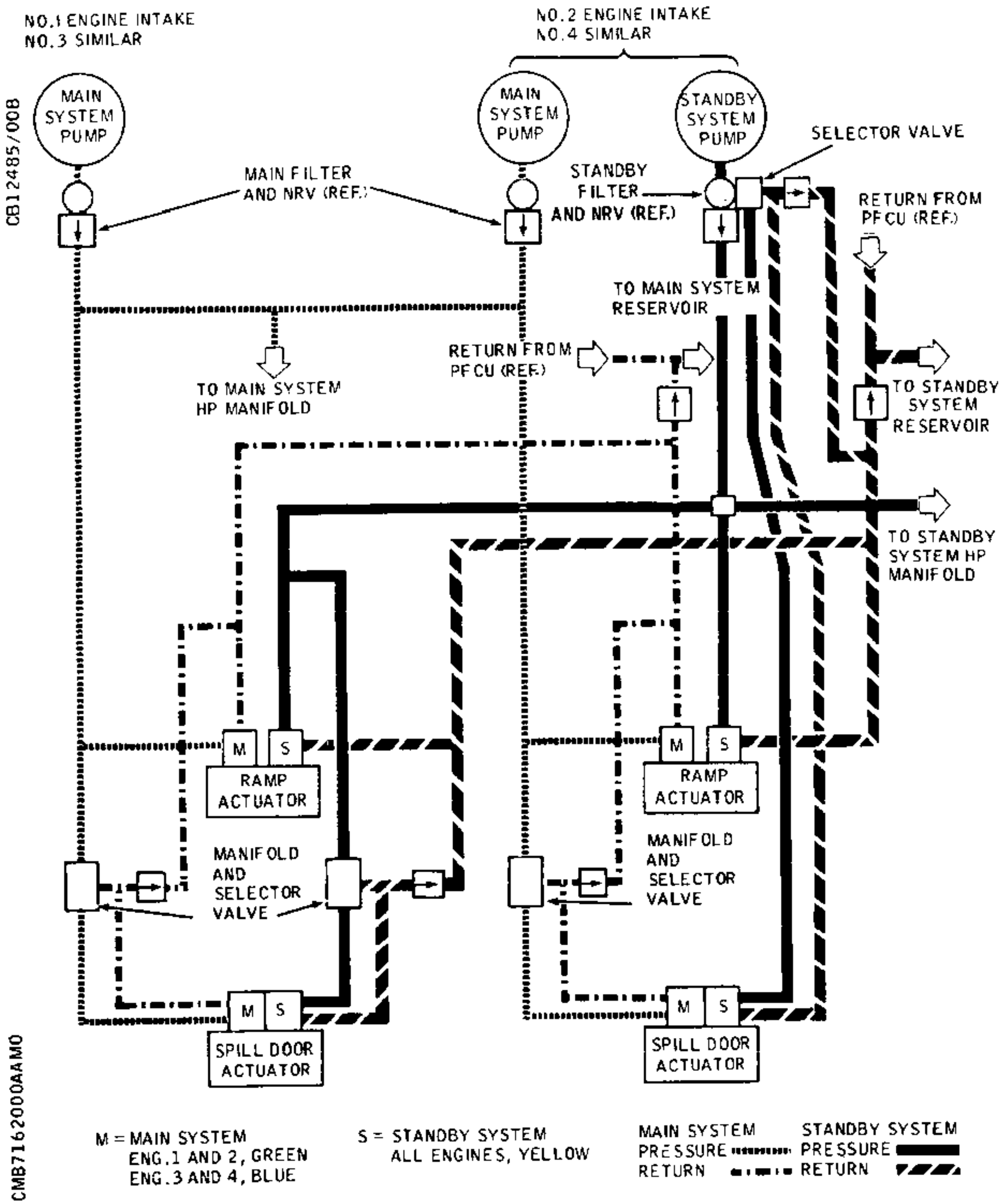
The pipelines of each pair of intakes are mainly above the boundary layer floor, with extensions downward into the filter bay of each intake; these extensions connect to the components associated with the spill door. Other downward pipeline extensions connect to a ramp actuator which is fitted to the roof of the intake.

Nearly all of the pipes in the intake systems are of metal; the exceptions are the four flexible pipes in each intake which interconnect the metal pipes with the spill door actuator.

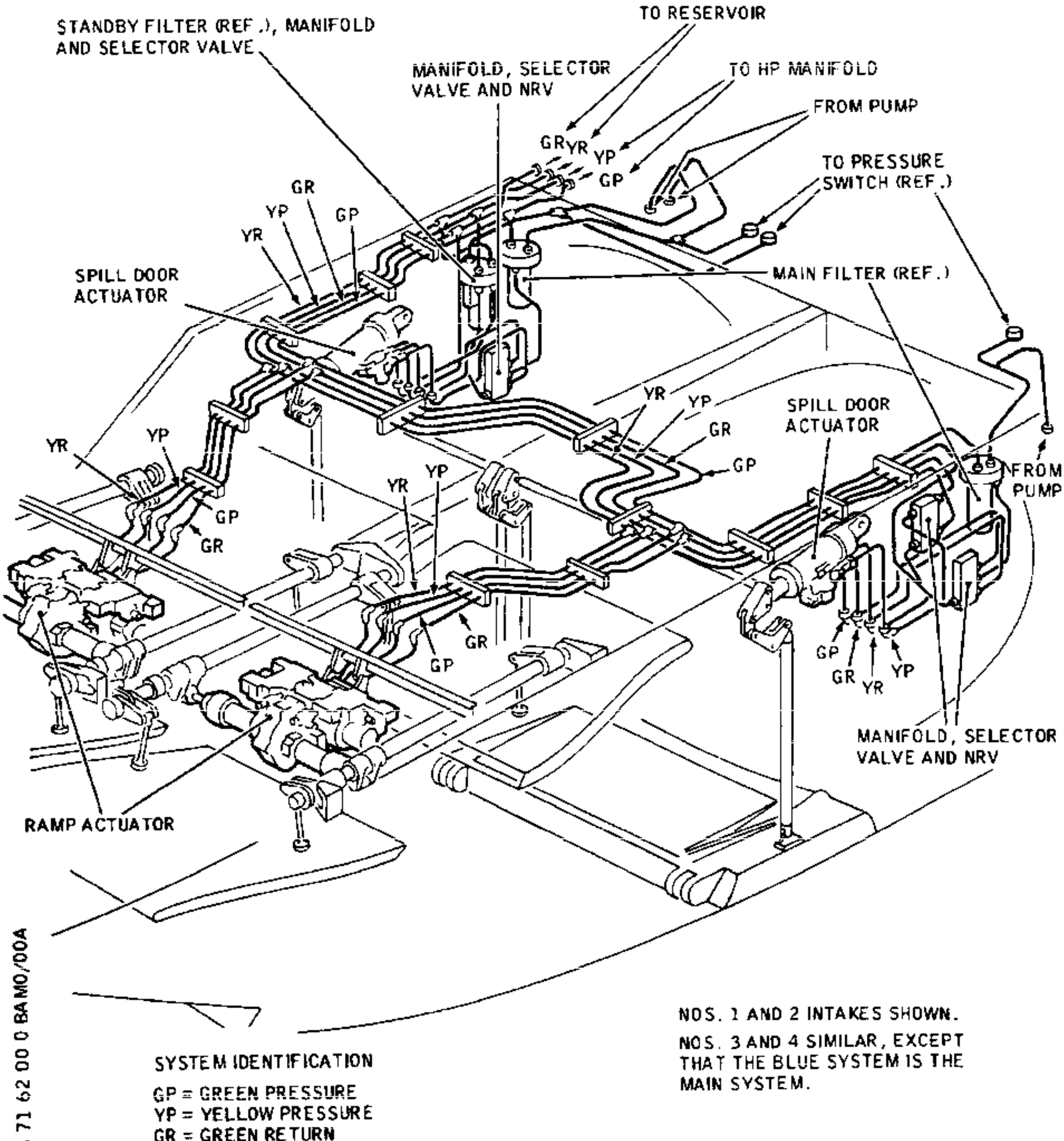
Some pipes that are susceptible to vibration are restrained by ligatures coated with sealant.

Three pressure switches, one for each hydraulic system, provide information (in conjunction with reservoir fluid low-level switches (Ref. Chap.29)) to the AICS.

Normally, the main system supplies the hydraulic power, with the standby system ready to supply power if the main system should fail. However, manual selection of either the main or the standby system may be effected by moving switches located on the intake management panel (Ref. 71-61-00).



Air Intake Hydraulic System - Schematic
Figure 001



NOS. 1 AND 2 INTAKES SHOWN.
NOS. 3 AND 4 SIMILAR, EXCEPT THAT THE BLUE SYSTEM IS THE MAIN SYSTEM.

SYSTEM IDENTIFICATION
GP = GREEN PRESSURE
YP = YELLOW PRESSURE
GR = GREEN RETURN
YR = YELLOW RETURN

\- Air Intake Hydraulic System
Figure 002

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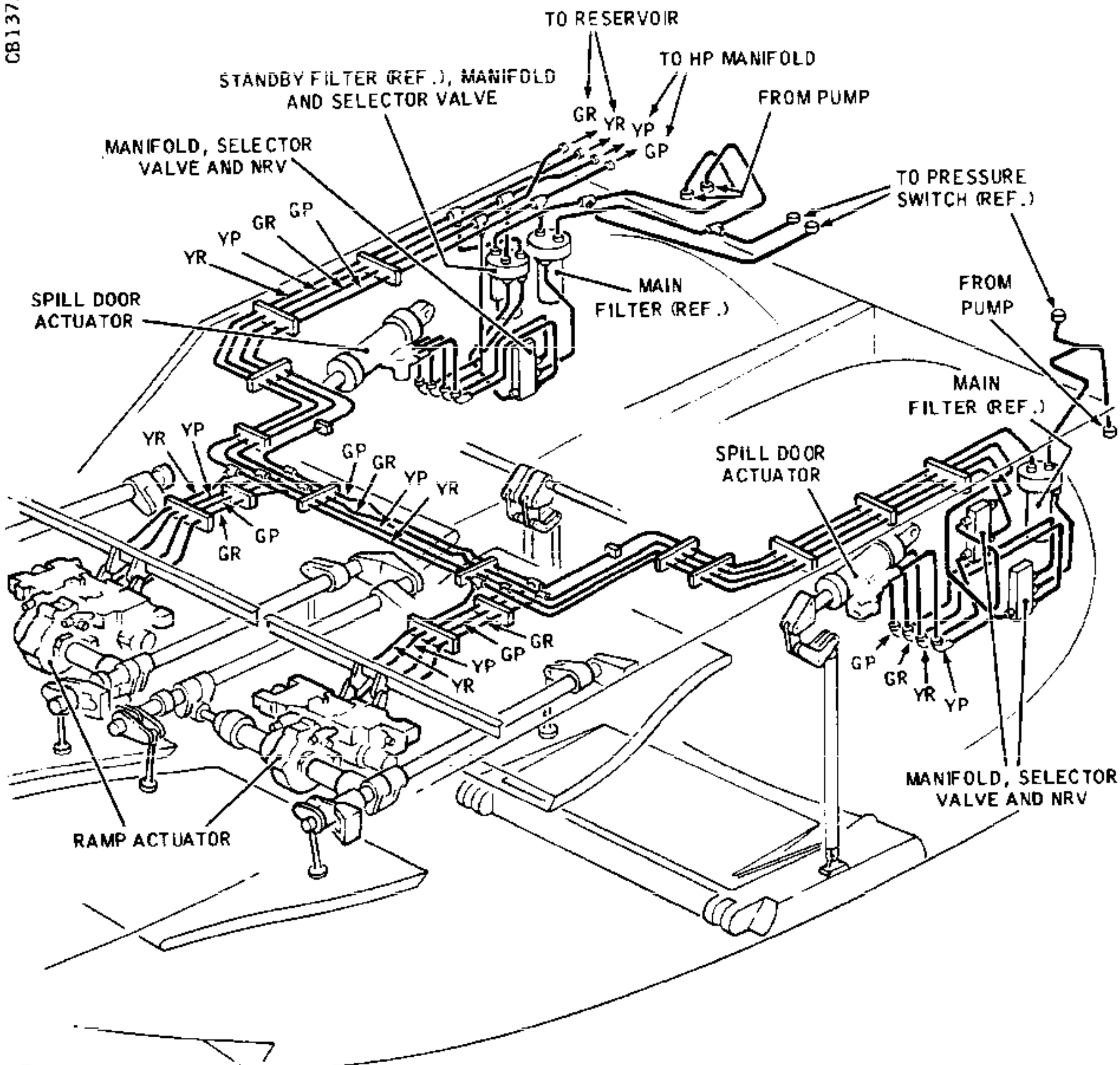

NOS. 1 AND 2 INTAKES SHOWN.

NOS. 3 AND 4 SIMILAR, EXCEPT THAT THE BLUE SYSTEM IS THE MAIN SYSTEM.

CMB 71 62 00 0 BAND

SYSTEM IDENTIFICATION

GP = GREEN PRESSURE
YP = YELLOW PRESSURE
GR = GREEN RETURN
YR = YELLOW RETURN

Air Intake Hydraulic System
Figure 003

Each intake hydraulic system has separate main and standby system selector valves which control the hydraulic supply to a spill door actuator. A ramp actuator in each intake has two integral solenoid selector valves (main and standby).

All spill door selector valves are mounted on manifolds, except the standby system selector valves of intakes 2 and 4; these valves are mounted on the associated standby filter heads (Ref. Chap.29) which serve as manifolds.

The manifold of each main system selector valve and the manifolds of the standby system selector valves of intakes 1 and 3 have non-return valves fitted externally. The standby system selector valves of intakes 2 and 4 have associated non-return valves within the standby filter heads. All non-return valves are in the return lines, with unrestricted flow toward the reservoirs.

2. Spill Door Actuator (Ref. Fig.004 and 005)

The actuator comprises a hydraulic jack and an electro-hydraulic unit bolted together. Fluid transfer between the jack and the unit is accomplished through matched drillings in the mating surfaces. The jack body houses a differential area piston.

A change-over valve, within the electro-hydraulic unit, automatically selects use of either the main or the standby system. Selection is achieved by a slide valve with a large area opposing the main pressure, and a small area piston, associated with the slide valve, opposing the standby pressure.

Depending upon the available pressures, the slide valve moves, connects the pressure line of the selected system to a double non-return valve, isolates the pressure line of the other system and connects the return line of the selected system to the common return line, within the electro-hydraulic unit.

The double non-return valve prevents pressurized fluid leakage between the systems.

A bypass valve, itself controlled by a solenoid valve, has a slide valve which is held in a bypass mode by spring pressure. In this mode, the slide valve allows pressurized fluid to flow from a back-pressure valve to the full area side of the jack piston. Return fluid passes through a fixed choke which controls the extension rate of the jack piston.

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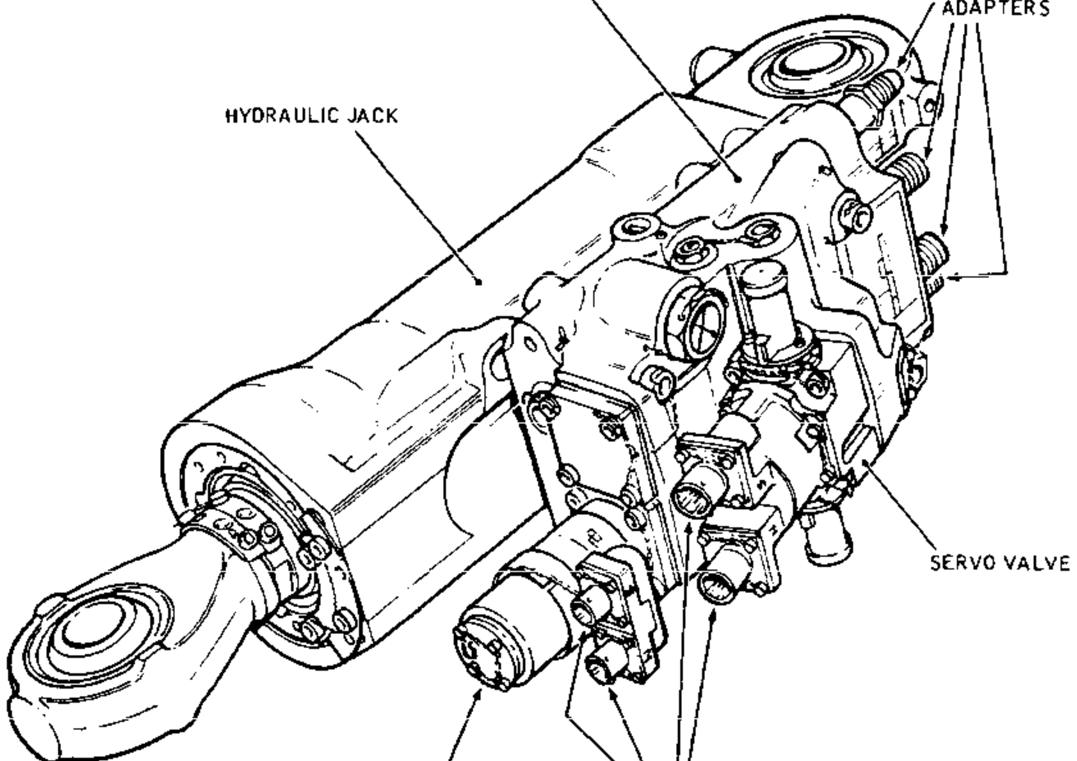

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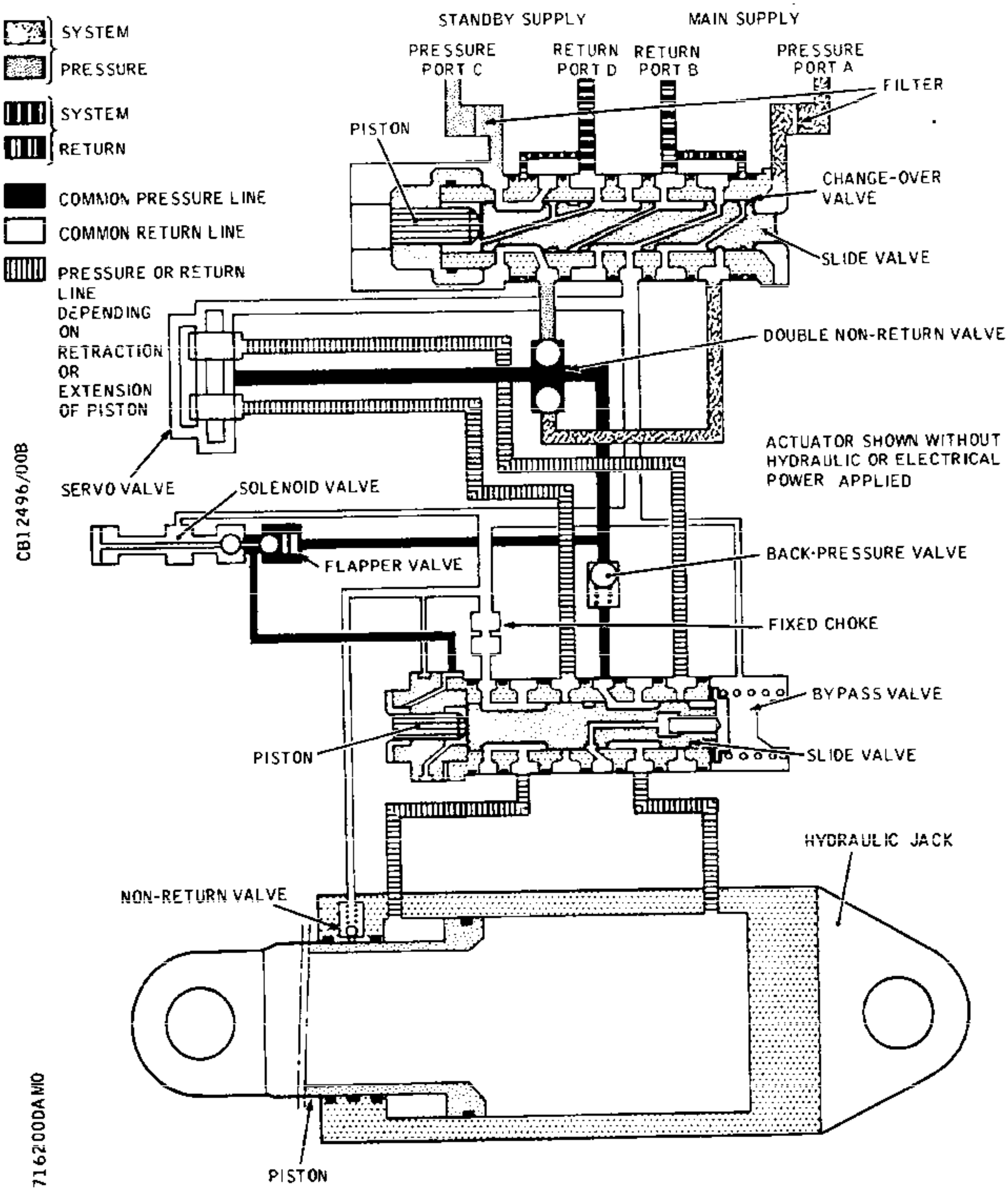
Spill Door Actuator
Figure 004



Spill Door Actuator - Schematic
Figure 005

The back-pressure valve prevents retraction of the jack piston when the actuator is unpressurized. This is achieved by a hydraulic lock formed between the full area side of the piston and the back-pressure valve.

The solenoid valve, when energized, allows pressurized fluid to move a piston and slide valve in the bypass valve, against spring pressure. This movement connects the pressure and return lines between the servo valve and the jack, and also isolates the pressure line between the full area side of the jack piston and the return line between the annular area side of the piston and the fixed choke.

The servo valve controls the extension and retraction of the jack piston after the bypass valve slide valve has connected the lines between the servo valve and the jack. The piston movement is governed by the electrical input to coils in the servo valve.

Depending upon the electrical input to the coils within the servo valve, the flow of pressurized fluid to each end of a slide valve is unbalanced. The greater pressure on one end of the slide valve moves it from the central position; this movement connects the pressure and return lines to the appropriate side of the actuator piston.

A non-return valve prevents external fluid leakage past the piston ram if a seal should fail, by allowing the fluid to enter the return circuit.

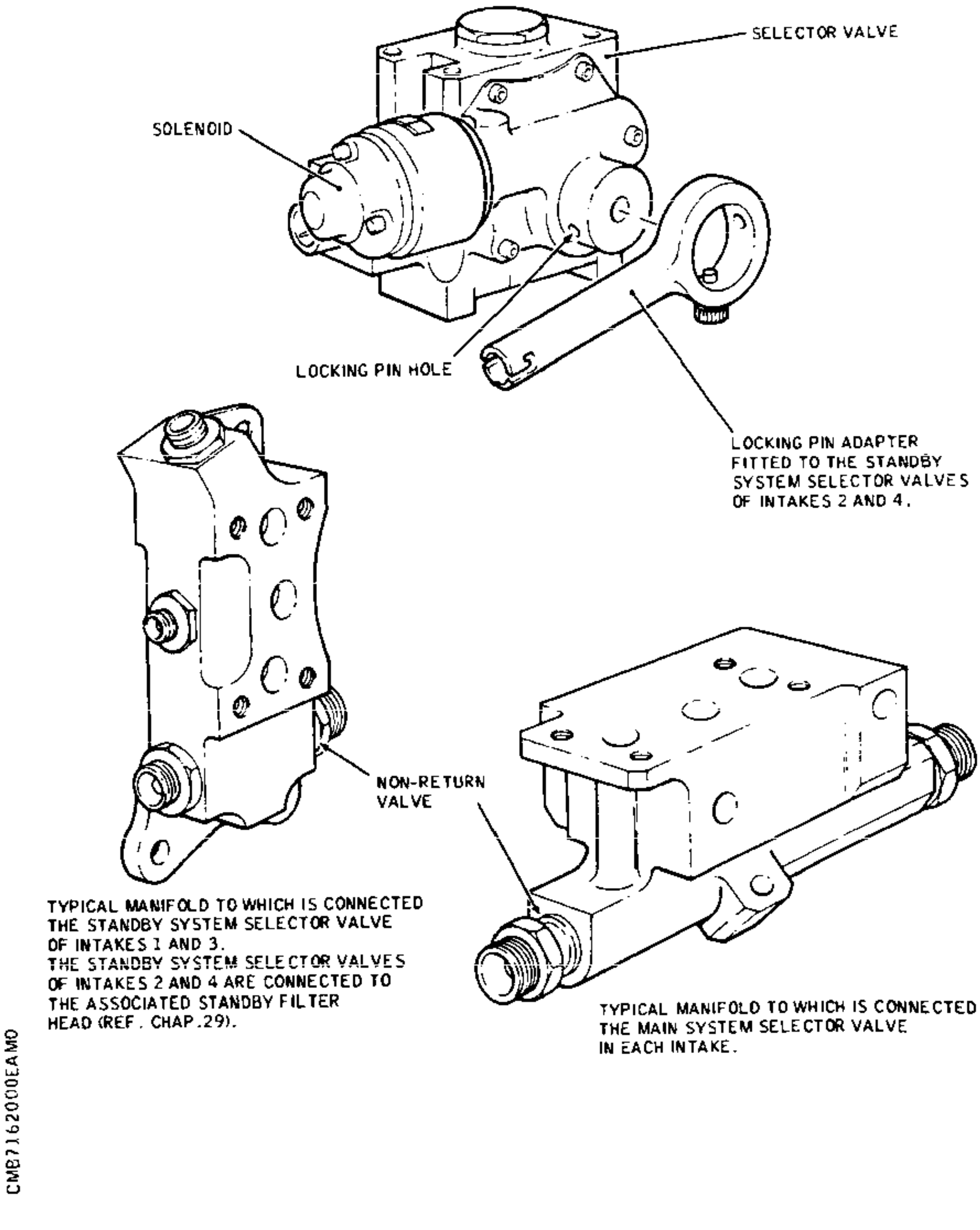
3. Selector Valve and Manifolds (Ref. Fig.006 and 007)

The selector valve is an electro-hydraulic unit and is used to control the hydraulic supply to the spill door actuator.

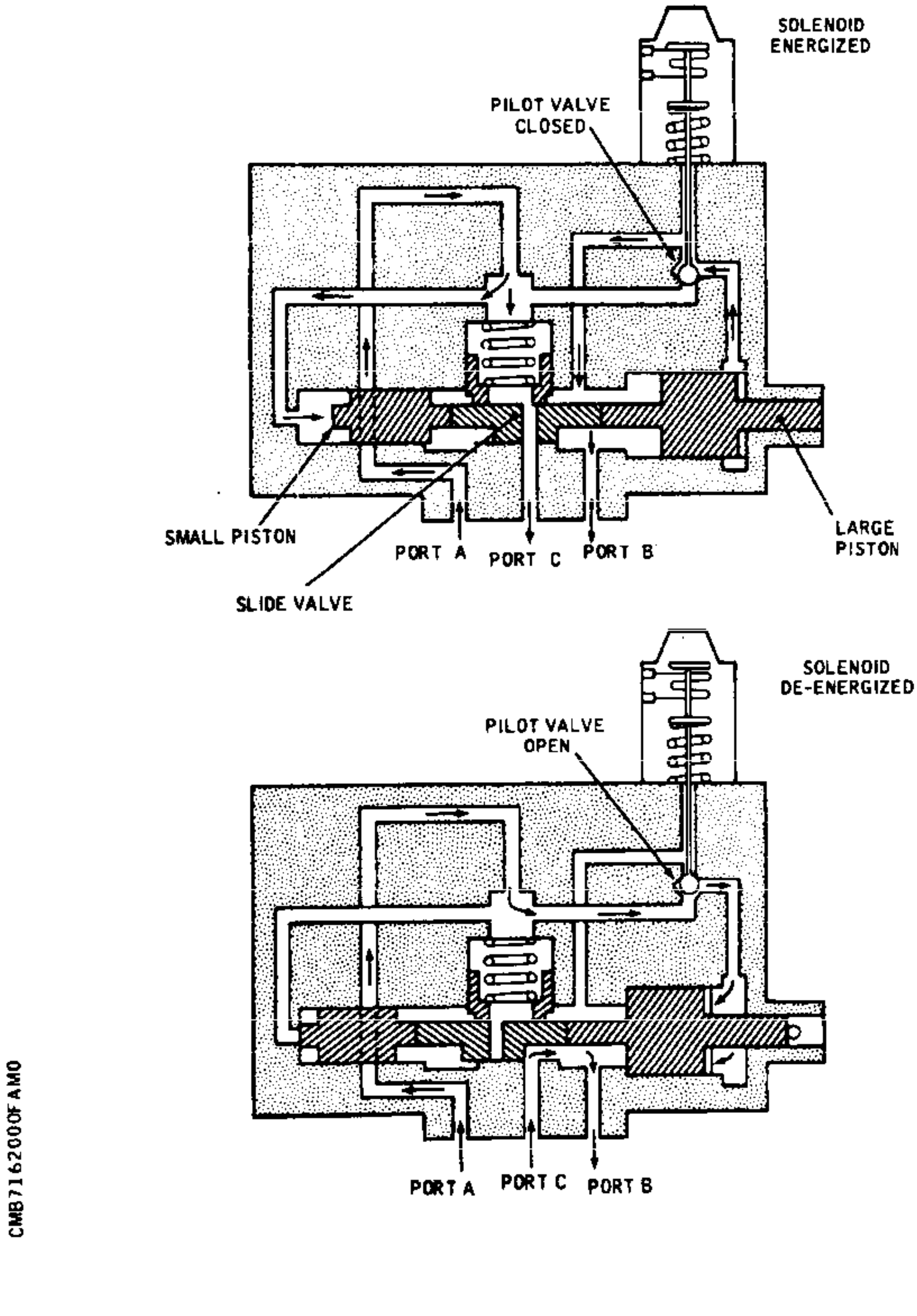
A slide valve, within the selector valve body, either directs pressurized fluid from port A through port C to the actuator, or connects the pressure line from the actuator through port C to the system return through port B.

The slide valve is moved by opposing pistons, one large and one small. Fluid flow to the small piston is direct and constant, while the flow to the large piston is controlled by a solenoid-operated pilot valve.

When the solenoid is de-energized, the pilot valve allows hydraulic pressure to flow to the large piston which, having a greater area, overcomes the pressure on the small piston



Selector Valve and Manifolds
Figure 006



Selector Valve - Schematic
Figure 007

and moves the slide valve in one direction.

When the solenoid is energized, the pilot valve removes the pressure from the large piston; the pressure on the small piston moves the slide valve in the opposite direction.

A projection on the selector valve body, housing an extension of the large piston, is drilled to accommodate a locking pin.

The locking pin is a ground servicing safety facility and is used to ensure that hydraulic pressure cannot reach the spill door actuator.

Each manifold is basically a body with drillings providing fluid passages to the port adapters.

Each manifold is used as a mounting base for a selector valve. Fluid transfer between the manifold and the valve is accomplished through matched drillings in the mating surfaces.

4. Ramp Actuator (Ref. Fig.008 and 009)

A ramp actuator is attached to the structure above the front ramp in each intake.

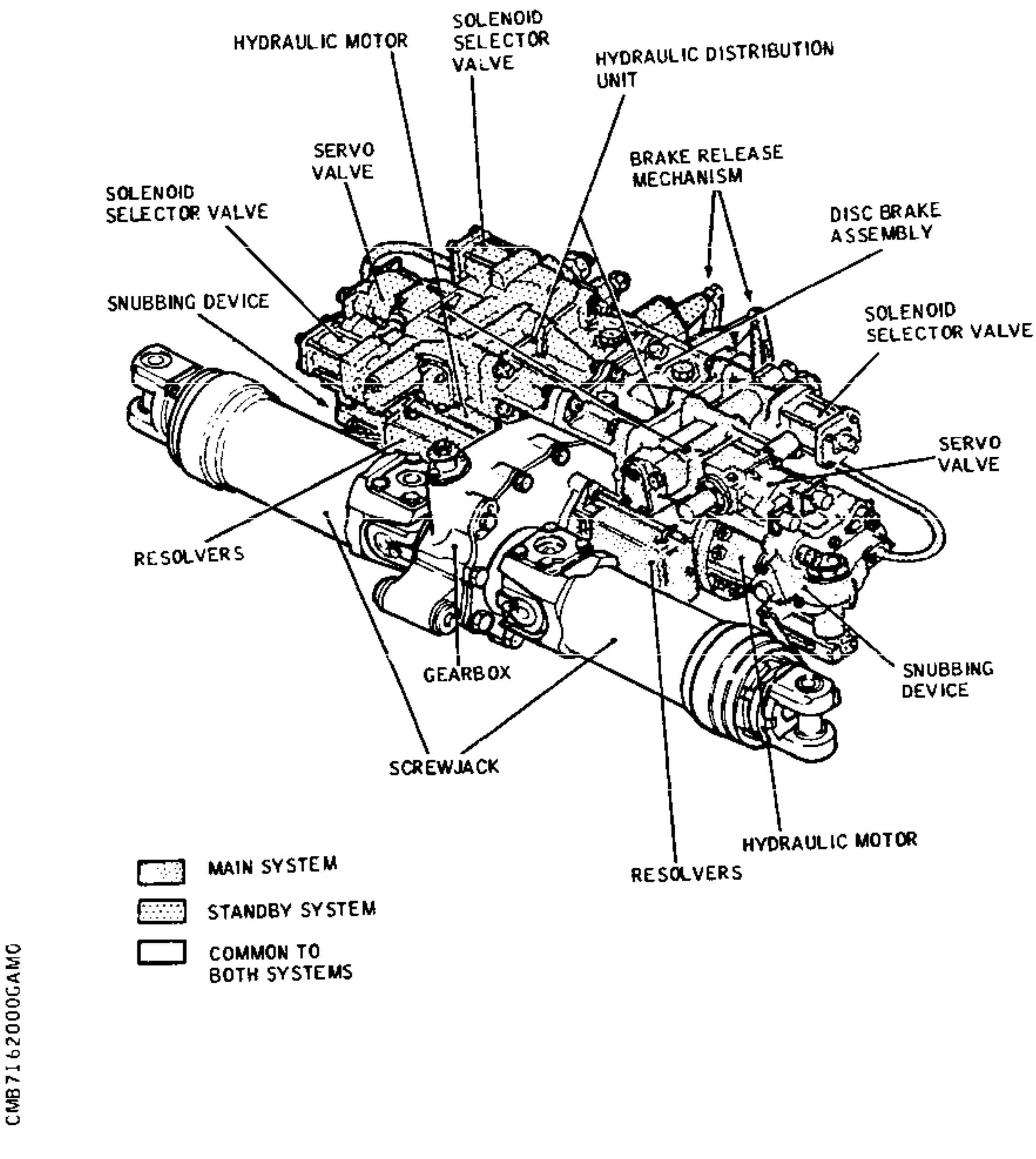
Each actuator is basically a gearbox, to the case of which are bolted a disc brake assembly, a main and a standby hydraulic distribution unit and four resolver assemblies. Further attachments on the gearbox are a main and a standby hydraulic motor, both connected by quick-disconnect clamps, and two screwjacks connected by universal joints.

The components of the main and standby systems are similar, with an additional brake test solenoid selector valve in the standby system.

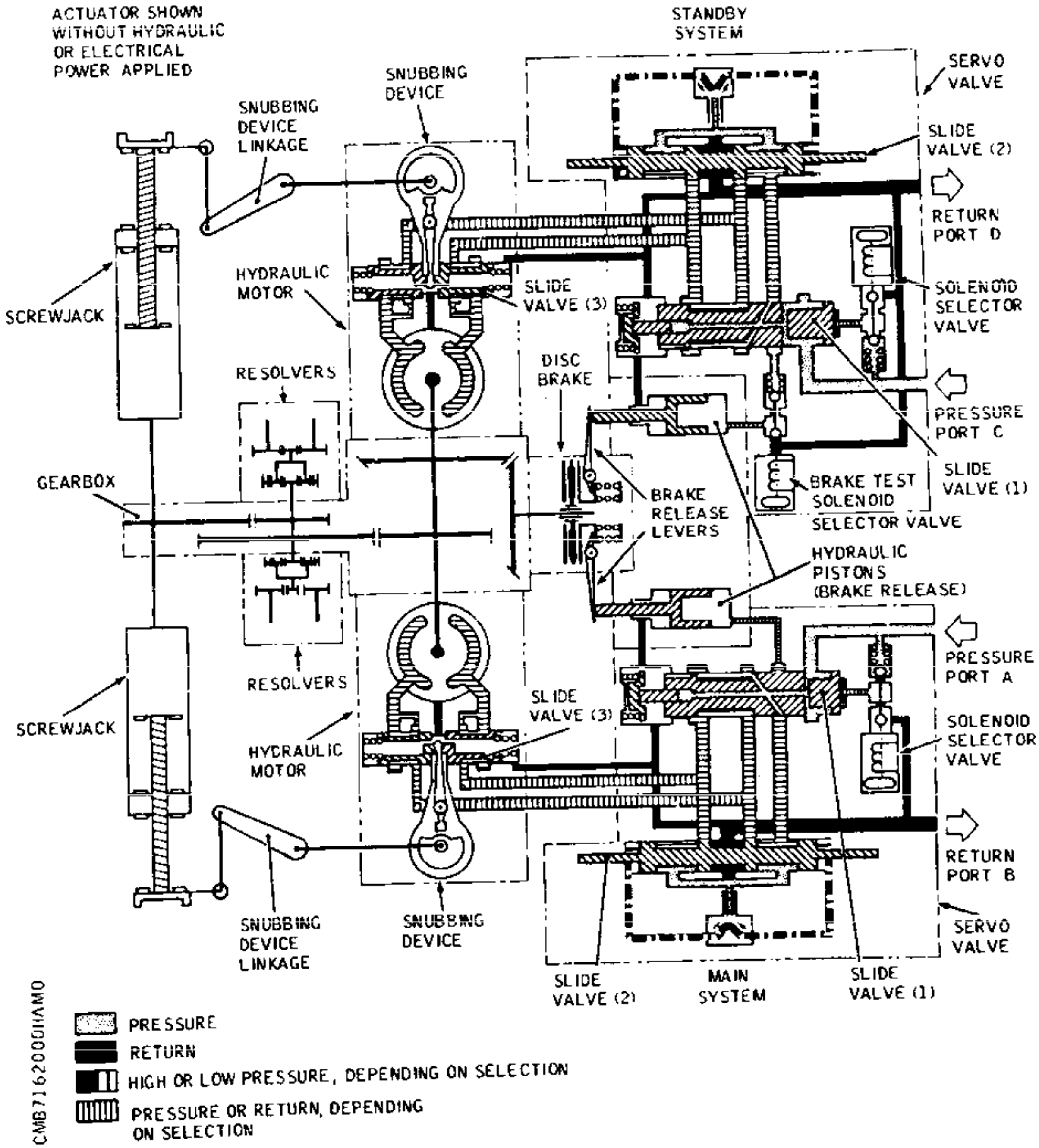
R A main or standby solenoid selector valve, in conjunction with
R a slide valve, controls the hydraulic supply to a servo valve
R and a hydraulic piston.

The solenoid selector valve, when energized, closes the return line and opens the pressure line at the end of the slide valve (1). Pressurized fluid moves the slide valve; this movement connects the pressure and return lines to the servo valve, and also connects the pressure line to the hydraulic piston which, in turn, moves a brake release lever to disengage the brake.

The servo valve, itself controlled by electrical signals,



Ramp Actuator
Figure 008



- Ramp Actuator - Schematic
Figure 009

controls the direction in which the hydraulic motor rotates.

Depending upon the electrical input to coils within the servo valve, the flow of pressurized fluid to each end of a slide valve (2) is unbalanced. The greater pressure on one end of the slide valve moves it from the central position; this movement connects the pressure and return lines to the hydraulic motor, via two slide valves (3) which are retained in the central position by spring pressure.

The two slide valves (3) constitute part of a snubbing device which gradually reduces the pressure supply to the motor as the screwjacks reach their end-of-stroke position; thus the screwjacks reach their end stops slowly.

The slide valves (3) are moved by a cam and lever through a snubbing device linkage connected to the screwjack.

The hydraulic motor, through a system of gears and shafts, rotates a threaded screw bush around the screw thread within each screwjack body. The screw bushes cannot move other than in a rotational sense, thus the screwjack bodies rotate to extend or retract the screw threads.

Further gears drive resolvers which supply electrical information to the AICS (Ref. 71-61-00), and a disc brake which, in the absence of hydraulic pressure, is engaged by spring pressure.

When one hydraulic motor is rotated under power, the other motor also rotates but acts as a hydraulic pump and circulates the fluid in a closed circuit between the motor and the slide valve of the servo valve.

The brake test solenoid selector valve in the standby system provides a means of checking that the brake is effective against power applied to the standby hydraulic motor.

When energized, the selector valve isolates the pressure supply to the hydraulic piston and also connects the piston to the return line. With the brake release system isolated, a normal selection of hydraulic power to move the screwjacks is counteracted by the brake and movement will not occur.

5. Operation

A. Control and Indication

For control and indication, refer to 71-61-00.

B. Functional Description

With electrical and hydraulic power available, the appropriate spill door selector valve (depending on system selected) is energized and pressurized fluid is directed to the actuator.

On receipt of electrical signals from the AICS, the solenoid valve and servo valve on the actuator are energized. The solenoid valve directs pressurized fluid and moves the slide valve of the bypass valve; simultaneously, the servo valve directs pressurized fluid to the selected side of the jack piston and, through the actuation mechanism (Ref. 71-64-00), moves the spill door to the position required.

When the spill door reaches its new position, the solenoid valve and servo valve on the actuator are de-energized but the selector valve remains energized.

With electrical and hydraulic power available, the appropriate solenoid selector valve (depending on system selected) of the ramps actuator is energized and pressurized fluid is directed to disengage the brake.

On receipt of electrical signals from the AICS, the servo valve is energized and directs pressurized fluid to the selected side of the hydraulic motor which, through the gearbox, screwjacks and actuation mechanism (Ref. 71-63-00), moves the ramps to the position required.

When the ramps reach their new position, the servo valve is de-energized but the solenoid selector valve remains energized, keeping the brake disengaged.

AIR INTAKE HYDRAULIC SYSTEM - SERVICING

WARNING: INADVERTENT OPERATION OF AN AIR INTAKE SPILL DOOR OR RAMPS MAY PROVE FATAL TO PERSONS WORKING IN THE IMMEDIATE VICINITY.

OBSERVE THE SPECIFIC WARNINGS AND CAUTIONS DETAILED IN THE PARTICULAR SERVICING OR MAINTENANCE PROCEDURE.

1. General

This topic defines the hydraulic and electrical isolation safety precautions which must be taken when any work on an engine air intake is being carried out.

Locking pins are used to ensure that the spill door selector valves are mechanically locked in the shut position, so that hydraulic power is isolated from the spill door actuator. These locking pins do not isolate hydraulic power from the ramps actuator.

Tripping, and fitting safety clips to, the circuit breakers associated with the air intake control system (AICS) ensures that the hydraulic selector valves for the ramp and spill door actuators cannot be energized.

Tripping, and fitting safety clips to, the circuit breakers associated with the hydraulic ground check-out system, ensures that the pumps cannot be operated.

R Fitting and locking an anti-interference plate to the intake management panel (Ref. 71-61-00), at the third crew member's (3CM) station, ensures that -

(a) the ramp/spill master switches are retained in the manual position, and

(b) the ramp and spill manual inching switches are retained in the centre (off) position.

This configuration keeps the ramp and spill actuators safe from inadvertent operation at the 3CM station.

When a ramp/spill test set, which has its own electrical supply, is connected to the ramps actuator, the test set will control the selector valves (which are an integral part of the actuator) independently of the aircraft electrical system;

thus the tripped circuit breakers have no isolating effect on the actuator. It is, therefore, incumbent upon the test set operator to ensure at all times that the test set switches are set so that if hydraulic power is applied to the aircraft, the ramps actuator will not move inadvertently.

When the ramp/spill test set is connected to the spill door actuator and its associated selector valves, the test set will control the selector valves and actuator independently of the aircraft electrical system; thus the tripped circuit breakers have no isolating effect on the valves or actuator. However, the locking pins, when fitted, will isolate the actuator from the hydraulic power supply but, as an additional precaution when the test set is not being operated, the switches must be set in the 'safe' position.

2. Servicing

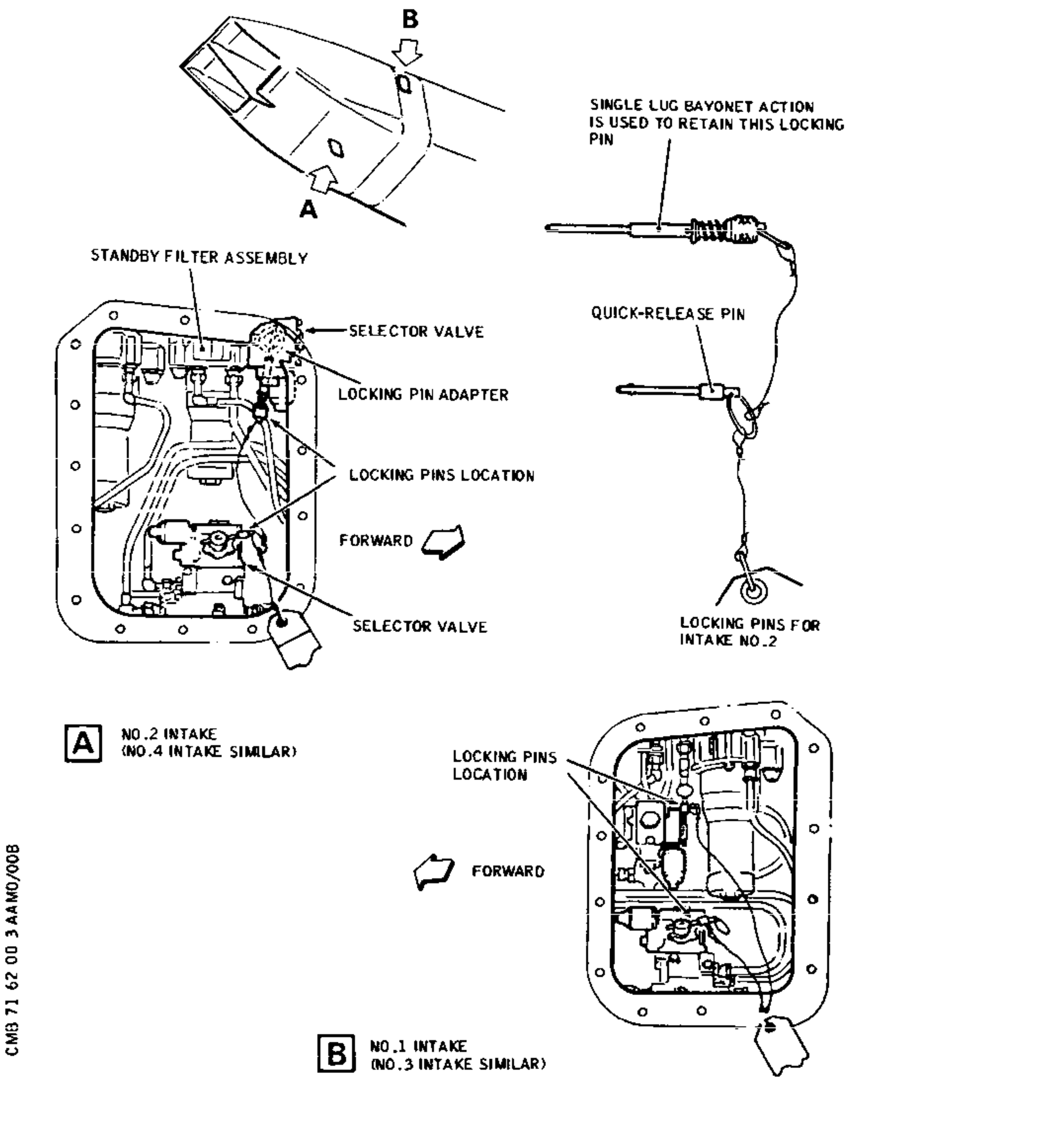
A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for spill door selector valves (No.2 and No.4 intakes)	E925037000
Locking pins, for spill door selector valves (No.1 and No.3 intakes)	E925038000
R Anti-interference plate, for R intake management panel	E925068000
Torque spanner, 25 to 30 lbf in (0.282 to 0.339 mdaN)	-
Driver (Torq-set)	No.10

B. Prepare (Ref. Fig. 301)

(1) Observe the electrical safety precautions detailed in 24-00-00.

(2) Observe the hydraulic safety precautions detailed in Chapter 29, and ensure that the appropriate main and the standby hydraulic systems are depressurized.



\- Spill Door Selector Valves - Mechanical Locking
Figure 301

(3) Ensure that the four intakes are clear of personnel and equipment.

(4) Position barriers to prevent persons from inadvertently entering the areas below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(5) Display a warning placard on the engine start panel to indicate that work is being carried out on the intakes.

(6) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Ensure that the four RAMP and the four SPILL switches are at the centre (off) position.

(c) Fit, and lock, the anti-interference plate. The key must be retained by a responsible person associated with the work on the intake.

(7) Remove the access panel, 411 JL, 421 JR, 431 JL or 441 JR, from the sidewall of the appropriate intake.

(8) Fit locking pins to the spill door hydraulc selector valves of the four intakes (two valves for each intake), as illustrated (Ref. Fig. 301)

(9) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(10) Trip and safety-clip any additional circuit breakers detailed in the specific servicing or maintenance topic.

C. Service

(1) Carry out the servicing or maintenance of the appropriate intake system as required.

(2) Satisfy the test requirements of the particular servicing or maintenance procedure. This will detail the required configuration of the aircraft system, e.g., locking pins fitted or removed, anti-interference plate fitted or removed, use of test

equipment, etc.

D. Conclusion

R
R
CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT, THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(1) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) At the intake management panel, proceed as follows:-

(a) Unlock and remove the anti-interference plate.

(b) Ensure that the four HYD switches are set to AUTO.

R
R
(c) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(4) Remove the safety clips and reset the circuit breakers previously tripped (Ref. para.B.(6)).

(5) Reset other circuit breakers tripped in the specific topic.

(6) Remove the warning placard from the engine start panel.

R (7) Remove the barriers from the four intake entries, and from beneath the spill doors.

R (8) Check that the seals on the access panels previously removed are not damaged, then refit the panels to the nacelle. Using the Torq-set driver, torque-tighten the panel fasteners to between 25 and 30 lbf in (0.282 and 0.339 mdaN).

AIR INTAKE HYDRAULIC SYSTEM - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN
R ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

IN ADDITION, IT MUST BE ENSURED THAT HYDRAULIC POWER IS NOT APPLIED TO THE APPROPRIATE MAIN (GREEN OR BLUE) SYSTEM AND THE STANDBY (YELLOW) SYSTEM.

1. General

This topic contains the general procedures for the removal and installation of the rigid hydraulic pipes in the filter bays, and for the flexible pipes which interconnect some rigid pipes with the spill door actuators. The procedures are under
R the following headings:

Rigid Hydraulic Pipe

Flexible Hydraulic Pipe

2. Rigid Hydraulic Pipe (Ref. Fig. 401, 402 and 403) (Ref. Fig. 404)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000

DESCRIPTION	PART NO.
Support, for spill door	-
Torque spanner, 130 to 150 lbf in (1.469 to 1.695 mdaN)	-
Torque spanner, 160 to 180 lbf in (1.808 to 2.034 mdaN)	-
Torque spanner, 295 to 305 lbf in (3.336 to 3.394 mdaN)	-
Torque spanner, 395 to 405 lbf in (4.464 to 4.576 mdaN)	-
R Kimwipe' tissues, or clean lint-free cloth	-
R Viton sealant (Ref.20-30-00) R No.351)	PR1720SM

B. Prepare to Remove Rigid Hydraulic Pipe

(1) Display a warning placard on the engine start panel at the third crew member's (3CM) station to indicate that work is being carried out on the engine intakes.

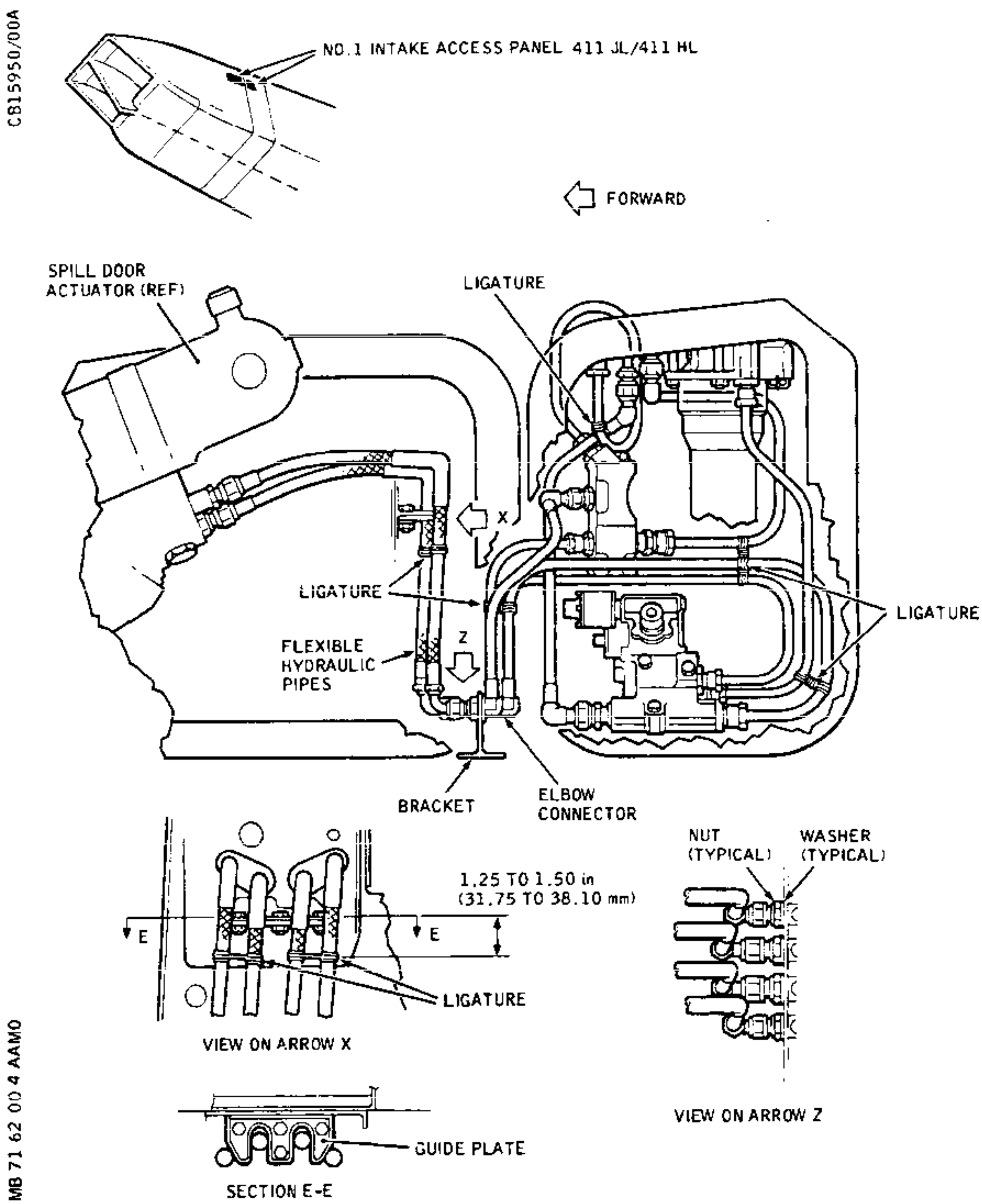
R (2) On the intake management panel, proceed as follows:

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

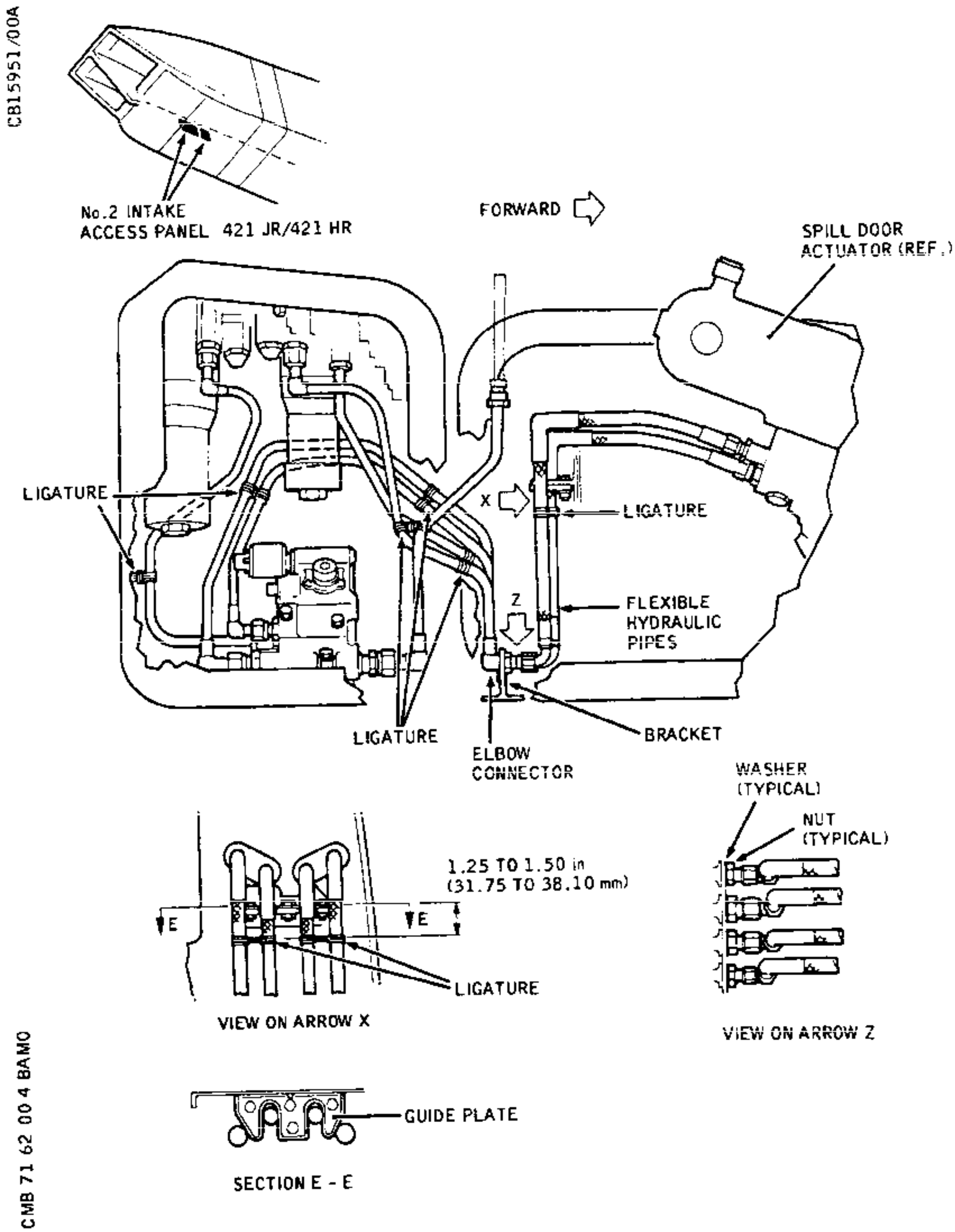
(b) Fit, and lock, the anti-interference plate.

(3) Fit locking pins to the spill door hydraulic selector valves of the four intakes (Ref. 71-62-00, Servicing).

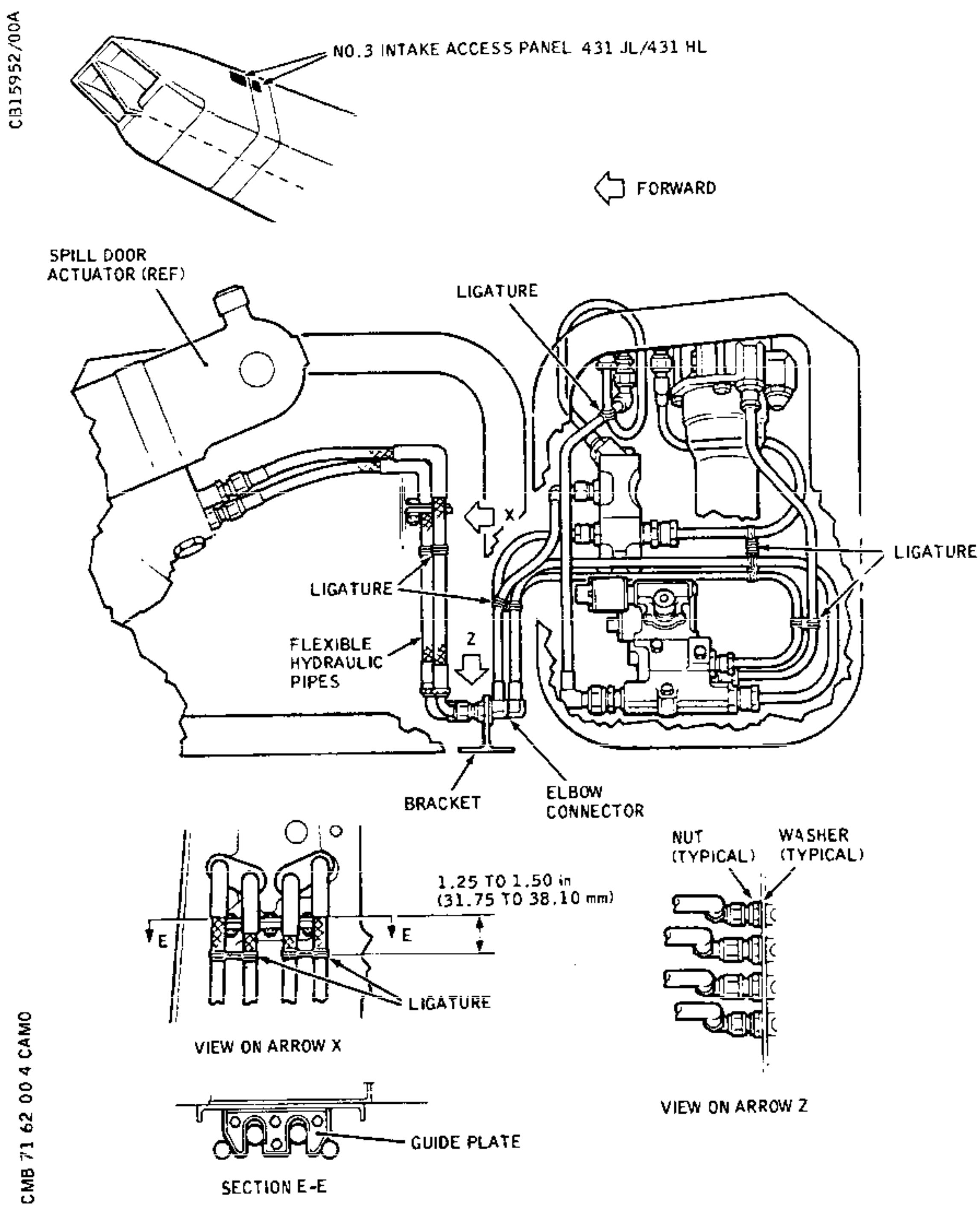
(4) Trip the following circuit breakers and fit safety clips.



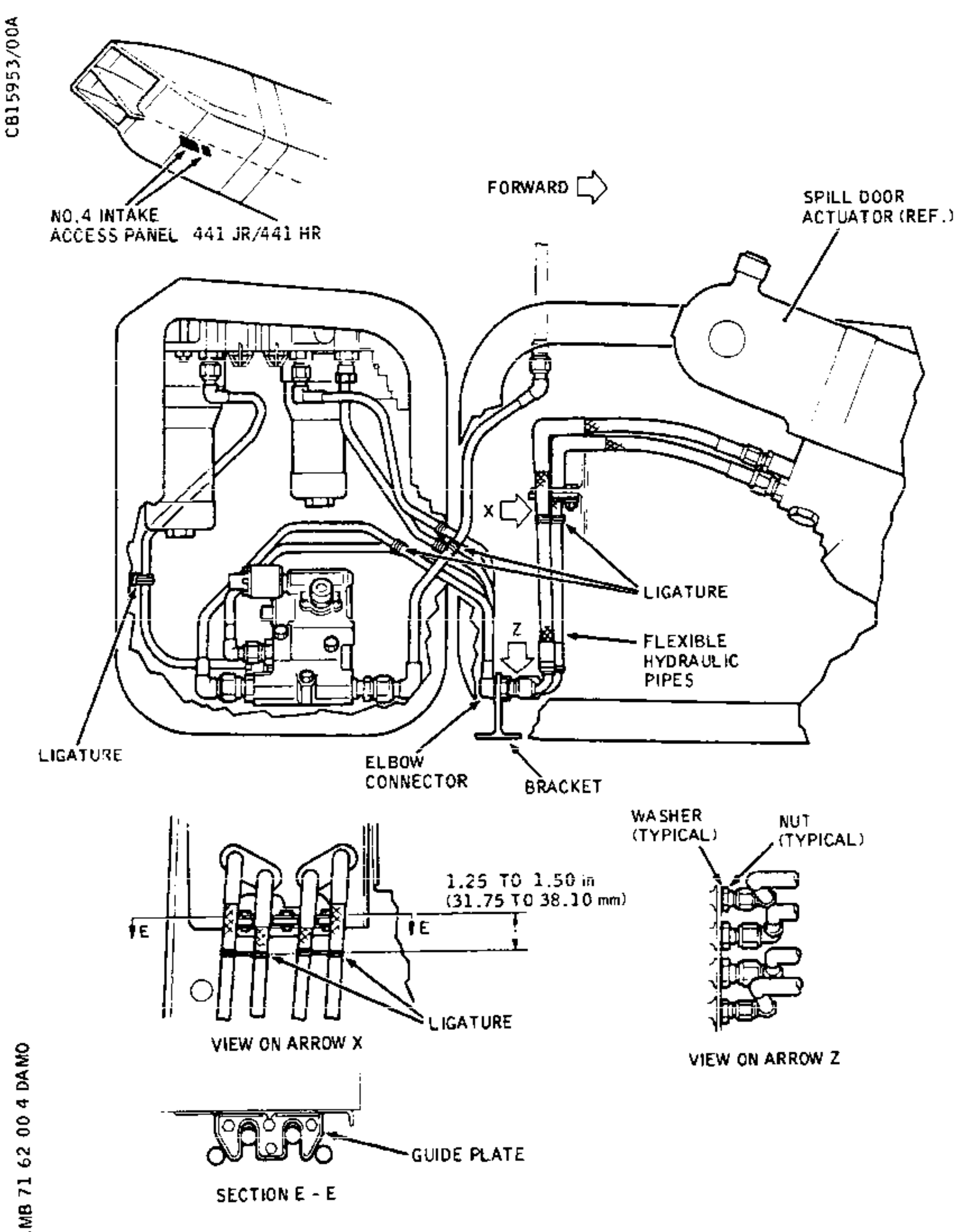
- No.1 Intake Filter Bay and Actuator Pipes -
Installation
Figure 401



- No.2 Intake Filter Bay and Actuator Pipes -
Installation
Figure 402



- No.3 Intake Filter Bay and Actuator Pipes -
Installation
Figure 403



- No.4 Intake Filter Bay and Actuator Pipes -
Installation
Figure 404

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(5) Position a support beneath the spill door.

(6) Ensure that the appropriate hydraulic system is depressurized and then depressurize the associated

reservoir (Ref. Chap.29).

(7) Remove the appropriate access panels, 411 JL/411 HL, 421 JR/421 HR, 431 JL/431 HL or 441 JR/441 HR from the intake sidewall.

(8) Position the container to collect the residual hydraulic fluid when the pipe is disconnected.

C. Remove

(1) Remove the ligature from the pipe to be removed and from any associated pipe. Discard the ligature.

R (2) Remove the appropriate pipe, as follows:

(a) Pipe with a union nut at each end:

a1) Unscrew the union nuts and remove the pipe.

(b) Pipe with a union nut at one end and an elbow connector at the other end:

b1) Unscrew the union nut at one end.

R
R
R
CAUTION: ENSURE THAT ANY PREFORMED BENDS IN THE FLEXIBLE PIPE ARE NOT ALTERED, IN OTHER WORDS, DO NOT STRAIGHTEN THE PIPE.

b2) At the elbow connector, unscrew the union nut on the flexible pipe.

b3) Unscrew the nut securing the elbow connector to the bracket, running the nut along both threads.

b4) Carefully ease the elbow connector away from the flexible pipe and remove the nut and washer.

b5) Remove the pipe.

R (3) Fit approved blanks to the removed pipe and to any other open pipe ends and exposed ports.

(4) Remove any spilled hydraulic fluid.

D. Install Rigid Hydraulic Pipe

(1) Ensure that the safety precautions taken in operations B.(1) to (6) have not been cancelled.

(2) Remove the blanks from the pipe to be fitted and any other blanks previously fitted.

(3) Ensure that all threads and ports are clean. Lightly lubricate the threads with clean hydraulic fluid.

(4) Install the appropriate pipe, in accordance with
R 20-23-11, as follows:

(a) Pipe with a union nut at each end:

a1) Position the pipe and hand-tighten the union nuts.

a2) Torque-tighten the union nuts, in accordance with 20-23-12, to the appropriate loading:

Nut on 0.3125 in dia. pipe: to between 130 and 150 lbf in (1.469 and 1.695 mdaN).

Nut on 0.375 in dia. pipe: to between 160 and 180 lbf in (1.808 and 2.034 mdaN).

(b) Pipe with a union nut at one end and an elbow connector at the other end:

b1) Position the pipe, easing the elbow connector threads through the bracket.

b2) Fit the washer and nut on the elbow connector, screwing the nut fully over the first thread and approximately halfway on to the second thread.

b3) Hand-tighten the union nut and then hand-tighten the nut on the elbow connector.

b4) Torque-tighten the nut on the elbow connector, in accordance with 20-23-12, to the appropriate loading:

Smaller dia. nut: to between 295 and 305 lbf in (3.336 and 3.394 mdaN).

Larger dia. nut: to between 395 and 405 lbf in (4.464 and 4.576 mdaN).

b5) Torque-tighten the union nut, in

accordance with 20-23-12, to the appropriate loading:

Nut on 0.3125 in dia. pipe: to between 130 and 150 lbf in (1.469 and 1.695 mdaN).

Nut on 0.375 in dia. pipe: to between 160 and 180 lbf in (1.808 and 2.034 mdaN).

CAUTION: ENSURE THAT THE FLEXIBLE PIPE IS CONNECTED
R WITH ANY PREFORMED BENDS AS NEAR AS POSSIBLE TO
R THEIR ORIGINAL POSITIONS.

(5) Connect the flexible pipe to the elbow connector, in accordance with 20-23-11, as follows:-

(a) Position the pipe and hand-tighten the union nut.

(b) Torque-tighten the union nut, in accordance with 20-23-12, to the appropriate loading:

b1) Smaller nut: to between 135 and 145 lbf in (1.525 and 1.638 mdaN).

b2) Larger nut: to between 215 and 245 lbf in (2.429 and 2.768 mdaN).

(6) Fit a new ligature in accordance with 20-23-14, ensuring that -

(a) the pipes are not moved from their normal 'set' position, and

(b) between each pair of pipes there are sufficient turns around the transverse binding to completely fill the gap between the pipes.

(7) Encapsulate the ligature with Viton sealant, PR1720SM, in accordance with 20-22-12.

E. Conclusion

(1) Remove the container used for collecting residual hydraulic fluid and remove any spilled fluid.

(2) Remove the support from beneath the spill door.

(3) Pressurize with air the appropriate hydraulic fluid

reservoir (Ref. Chap.29).

(4) Carry out a Functional Test of the spill door as detailed in 74-64-11, Adjustment/Test.

3. Flexible Hydraulic Pipe (Ref. Fig. 401, 402 and 403) (Ref. Fig. 404)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner, 135 to 145 lbf in (1.525 to 1.638 mdaN)	-
Torque spanner, 215 to 245 lbf in (2.429 to 2.768 mdaN)	-
R 'Kimwipe' tissues, or clean lint-free cloth	-
R Viton sealant (Ref.20-30-00, R No. 351)	PR1720SM

B. Prepare to Remove Flexible Pipe

(1) Carry out the procedures detailed in paragraphs 2.B.(1) to (8).

C. Remove Flexible Pipe

R CAUTION: ENSURE THAT ANY PREFORMED BENDS IN THE FLEXIBLE
R PIPE ARE NOT ALTERED, IN OTHER WORDS, DO NOT
R STRAIGHTEN THE PIPE.

(1) Remove the ligature from the pipe to be removed and from the adjacent pipe. Discard the ligature.

(2) Unscrew the union nuts and remove the pipe.

R (3) Fit approved blanks to the elbow connector, to the actuator adapter and to the removed pipe.

D. Install Flexible Pipe

CAUTION: ENSURE THAT THE FLEXIBLE PIPE IS CONNECTED WITH

R ANY PREFORMED BENDS AS NEAR AS POSSIBLE TO THEIR
R ORIGINAL POSITIONS.

(1) Remove the blanks from the pipe, elbow connector and actuator adapter.

(2) Position the pipe, ensuring that it is correctly situated in the guide plate.

(3) Connect the pipe to the actuator adapter and elbow connector in accordance with 20-23-11. Hand-tighten the union nuts.

(4) Tighten the pipe union nuts, torque-loading them as detailed in Table 401 and in accordance with 20-23-12.

SYSTEM	SERVICE	PORT	TORQUE LOADING
Main	Pressure	A	135 to 145 lbf in (1.525 to 1.638 mdaN)
Main	Return	B	215 to 245 lbf in (2.429 to 2.768 mdaN)
Standby	Pressure	C	135 to 145 lbf in (1.525 to 1.638 mdaN)
Standby	Return	D	215 to 245 lbf in (2.429 to 2.768 mdaN)

NOTE: The port identification letters are marked on the actuator body, near the appropriate adapter.

Flexible Pipe Connections and Torque Loading
Table 401

(5) Fit a new ligature in accordance with 20-23-14, ensuring that -

(a) the pipes are not moved from their normal 'set' position,

(b) between each pipe there are sufficient turns around the transverse binding to completely fill the gap between the pipes, and

(c) the pipes are not strained against the guide plate.

(6) Encapsulate the ligature with Viton sealant, PR1720SM, in accordance with 20-22-12.

E. Conclusion

(1) Remove the container used for collecting residual hydraulic fluid and remove any spilled fluid.

(2) Remove the support from beneath the spill door.

(3) Pressurize with air the appropriate hydraulic fluid reservoir (Ref. Chap.29).

(4) Carry out a Functional Test of the spill door as detailed in 71-64-11, Adjustment/Test.

NON-RETURN VALVE - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

Non-return valves (NRVs) associated with the main and standby hydraulic return pipes, from the spill door actuator, are located in each intake sidewall. Two NRVs, one to each manifold, are fitted in each of Nos.1 and 3 intake bays. Only one NRV, for the main system return pipe, is assembled to a manifold in each of bays 2 and 4. The standby system NRVs, for bays 2 and 4, are assembled within the standby system filter head (Ref. Chap.29).

The following procedure for the removal and installation of an NRV is applicable to all.

R 2. Non-return Valve (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Container, for hydraulic fluid	-

DESCRIPTION	PART NO.
Torque spanner, 160 to 180 lbf in (1.808 to 2.034 mdaN)	-
Torque spanner, 350 to 370 lbf in (3.955 to 4.181 mdaN)	-
R 'Kimwipe' tissues, or clean lint-free cloth	-
R Viton sealant (Ref.20-30-00, R No.351)	PR1720SM

B. Prepare

(1) Display a warning placard on the engine start panel at the third crew member's (3CM) station to indicate that work is being carried out on the engine intakes.

(2) On the intake management panel, proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to 'MAN'.

(b) Fit, and lock, the anti-interference plate.

(3) Fit locking pins to the spill door hydraulic selector valves of the four intakes (Ref. 71-62-00, Servicing).

(4) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(5) Ensure that the appropriate hydraulic system is depressurized and depressurize the associated reservoir (Ref. Chap.29).

(6) Remove the appropriate access panel, 411 JL, 421 JR, 431 JL or 441 JR, from the intake sidewall.

C. Remove

(1) Position the container to collect the residual hydraulic fluid when the pipes are disconnected.

(2) Restraining the NRV against turning, loosen the pipe nut.

(3) If necessary, remove the ligature completely and loosen the pipe nuts at the pipe couplings sufficiently to enable the pipe to be moved clear of NRV.

(4) Remove the NRV, complete with the O-ring gasket, from the manifold. Discard the gasket.

R (5) Fit approved blanks to the pipe, and exposed port of the manifold and NRV.

(6) Remove any spilled hydraulic fluid.

D. Install

(1) Ensure that the safety precautions taken in operations B.(2) to (4) have not been cancelled.

(2) Remove the blanks from the manifold and NRV.

(3) Ensure that the threads and port of the manifold are clean. Lubricate the threads lightly with clean hydraulic fluid.

(4) Lubricate the new O-ring gasket with clean hydraulic fluid and assemble it to the NRV.

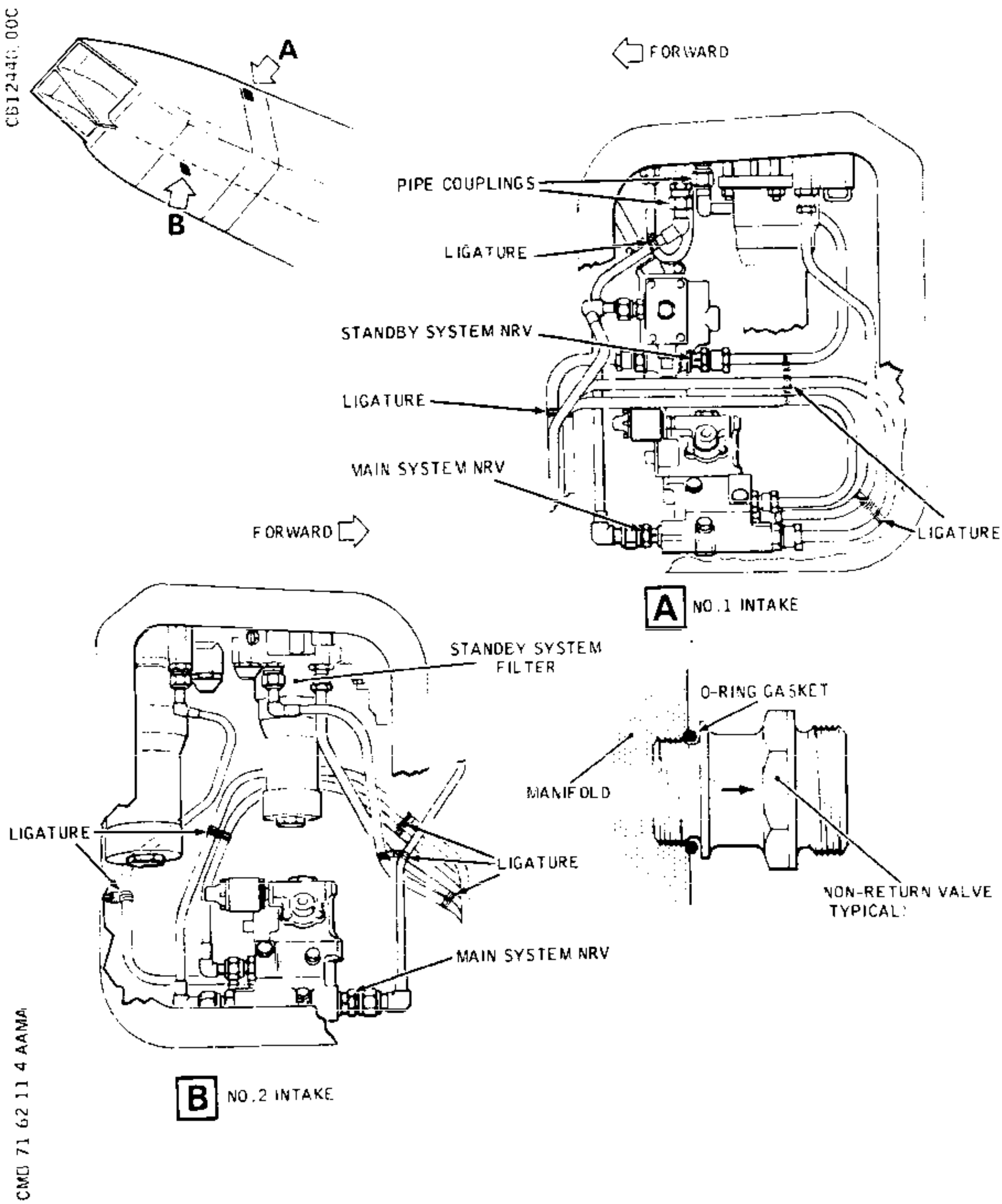
(5) Fit the NRV to the manifold; hand-tighten the NRV.

(6) Torque-tighten the NRV to between 350 and 370 lbf in (3.955 and 4.181 mdaN) in accordance with 20-23-12.

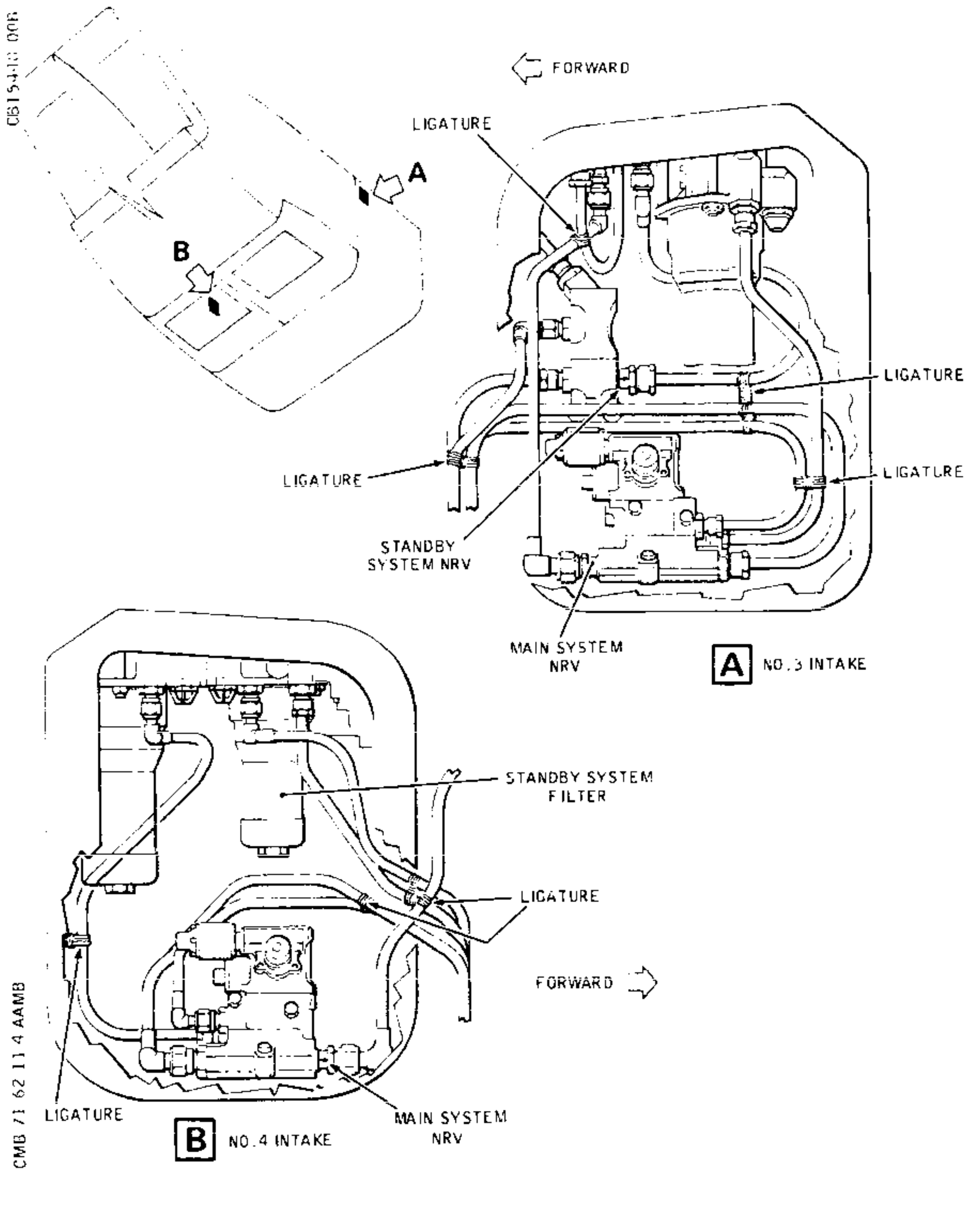
(7) Remove the blank from the pipe. Ensure that the pipe nut threads and pipe end are clean, and lubricate them lightly with clean hydraulic fluid.

(8) Fit the pipe to the NRV; hand-tighten the pipe nut.

(9) If the pipe nuts at the pipe couplings were loosened, hand-tighten them.



- Non-return Valve - Installation (Sheet 1 of 2)
Figure 401



\- Non-return Valve - Installation (Sheet 2 of 2)
Figure 401

(10) Torque-tighten the pipe nuts to between 160 and 180 lbf in (1.808 and 2.034 mdaN) in accordance with 20-23-12.

(11) If applicable, renew the ligature in accordance with with 20-23-14, ensuring that -

(a) the pipes are not moved from their normal 'set' position, and

(b) between each pair of pipes there are sufficient turns around the transverse binding to completely fill the gap between the pipes.

(12) Encapsulate the ligature with sealant in accordance with 20-22-12.

E. Conclusion

(1) Remove the container used for collecting hydraulic fluid and remove any spilled fluid.

(2) Carry out a Functional Test as detailed in 71-64-12, Adjustment/Test.

SELECTOR VALVE - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

Two selector valves, one for the main hydraulic system, the other for the standby system, are located within the sidewall structure of each intake. Access to the valves is gained by removing a panel from each intake sidewall.

The main and standby system valves of intakes 1 and 3 and the main system valves of intakes 2 and 4 are mounted on manifolds attached to the appropriate sidewall structure. The standby system valves of intakes 2 and 4 are mounted on the filter heads of the standby system filters.

To remove the standby system valves of intakes 2 and 4, it is necessary to first remove the filter head in accordance with Chapter 29. These valves are fitted with locking pin adapters which must be transferred to the replacement valve.

2. Selector Valve (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

DESCRIPTION	PART NO.
Locking pin, for selector valves	E925037000
Locking pin, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Container, for hydraulic fluid	-
Torque spanner, 15 to 20 lbf in (0.169 to 0.226 mdaN)	-
Torque spanner, 55 to 66 lbf in (0.621 to 0.746 mdaN)	-
Locking wire	-
Kimwipe tissues, or clean lint-free cloth	-

B. Prepare

(1) Ensure that the four intakes are clear of persons and equipment.

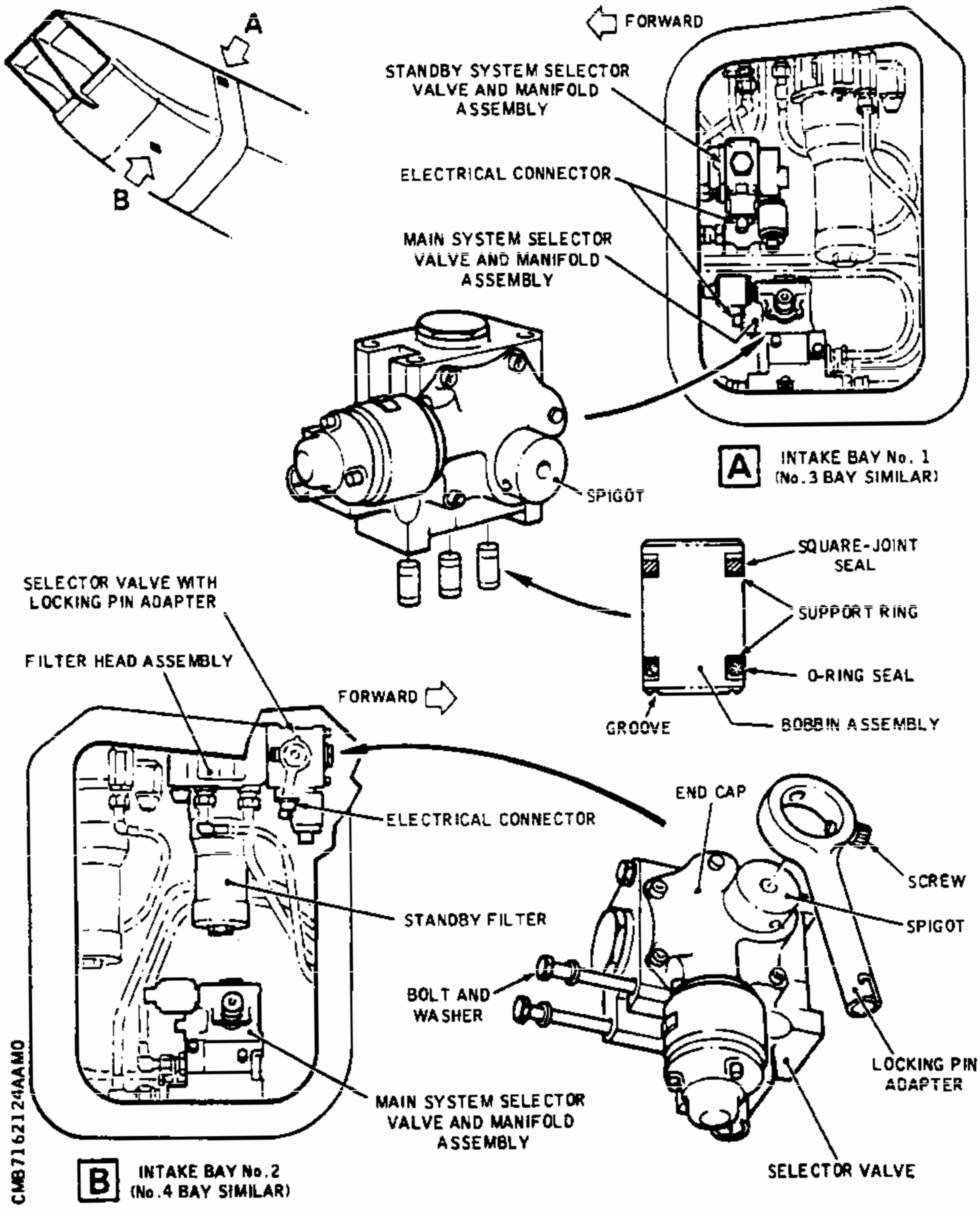
(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out in the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Fit, and lock, the anti-interference plate.



Selector Valve - Installation
Figure 401

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

WARNING: ENSURE THAT HYDRAULIC POWER IS NOT APPLIED TO THE AIRCRAFT UNTIL THE SELECTOR VALVE IS INSTALLED AND THE LOCKING PIN FITTED.

(7) Depressurize the appropriate main and the standby hydraulic systems and reservoirs (Ref. Chap.29).

(8) Remove the appropriate access panel, 411 JL, 421 JR, 431 JL or 441 JR, from the intake sidewall to gain access to the valve.

C. Remove

(1) Disconnect the electrical connector from the valve.

(2) Position the container to collect residual hydraulic fluid when the valve or filter head is removed.

(3) If removing a filter head mounted valve, proceed as follows:-

(a) Remove the filter head from the intake (Ref. Chap.29).

(b) Loosen the screw of the locking pin adapter sufficiently, and remove the adapter from the spigot on the end cap of the valve.

(4) Remove the four bolts attaching the valve to the manifold or filter head, as appropriate.

(5) Pull the valve from the manifold or filter head.

(6) Remove the bobbins and remove and discard the old seals. Retain the bobbins for reassembly.

(7) Fit suitable blanks to the exposed ports of the valve and manifold or filter head.

(8) Remove any spilled hydraulic fluid.

D. Prepare to Install

(1) If assembling a valve to the standby filter head, proceed as follows:-

(a) Fit the locking pin adapter to the spigot on the end cap of the valve, with the

screw of the locking pin adapter next to the flat surface of the spigot.

(b) To ensure correct alignment of the locking pin adapter, insert the bayonet-action locking pin (Ref. 71-62-00, Servicing) into the adapter and valve.

(c) Torque-tighten the screw to between 15 and 20 lbf in (0.169 and 0.226 mdaN).

(d) Lock the screw to the adapter with locking wire in accordance with 20-21-13.

(e) Remove and then refit the locking pin, ensuring that the locking pin slides smoothly in the valve and adapter.

E. Install

(1) Ensure that the safety precautions taken in Operations B.(2) to (6) have not been cancelled.

R (2) Clean the bobbins and fit the new seals in accordance with 20-22-16.

(3) Remove the blanks from the ports of the valve and manifold or filter head.

(4) Ensure that the ports are clean; lightly lubricate the ports with clean hydraulic fluid.

R (5) Fit the grooved end of the bobbins into the manifold.

R (6) Position the valve and bobbins on the manifold or filter head, ensuring that the seals are not damaged during assembly. Fit the four bolts and washers, with the countersunk side of the hole in the washers toward the bolt heads.

(7) Torque-tighten the bolts to between 55 and 66 lbf in (0.621 and 0.746 mdaN).

(8) Lock the bolts in pairs with locking wire in accordance with 20-21-13.

(9) If the valve was fitted to the filter head, refit the filter head and standby filter in accordance with Chapter 29.

(10) Connect the electrical connector to the valve, ensuring that the mating surfaces are clean and undamaged.

(11) Remove the container used for collecting hydraulic fluid, and remove any spilled fluid.

(12) Transfer the locking pin from the removed valve to the installed valve.

F. Conclusion

(1) Carry out a Functional Test of the appropriate selector valve as detailed in Adjustment/Test.

SELECTOR VALVE - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

This topic contains the Functional Test of the selector valve. The Test is required, after a valve has been installed, to confirm correct installation and operation of the valve. A Functional Test in 71-61-00 checks the air intake control unit's (AICU) control of the selector valve.

Control and indication of the spill door operation is effected at the air intake management panel (Ref. 71-61-00).

The Test is applicable to the selector valves of each of the four intakes, the only difference being in the hydraulic system used, i.e., green, blue (main) or yellow (standby).

Operational and System Tests are not applicable in this instance.

2. Functional Test

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000

DESCRIPTION	PART NO.
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Stopwatch	-

B. Prepare

(1) Ensure that the four intakes are clear of personnel and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel to indicate that work is being carried out on the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system associated with the selector valve under test, i.e., "GREEN" or "BLUE" (main) or "YELLOW" (standby).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

	SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
	Engine 1			
R	INT 1 MAIN HYD SUP	1-213	1K1950	D9
R	INT 1 ST'BY HYD SUP	15-216	1K1960	B8
R	AICU 1A SUP	2-213	1K2050	D14
R	AICU 1B SUP	14-21	1K2051	A5
R	Engine 2			
R	INT 2 MAIN HYD SUP	15-215	2K1950	B18
R	INT 2 ST'BY HYD SUP	1-213	2K1960	E9
R	AICU 2A SUP	13-216	2K2050	A3
R	AICU 2B SUP	2-213	2K2051	H14
R	Engine 3			
R	INT 3 MAIN HYD SUP	5-213	3K1950	A7
R	INT 3 ST'BY HYD SUP	15-215	3K1960	C18
R	AICU 3A SUP	2-213	3K2050	H13
R	AICU 3B SUP	13-216	3K2051	B3
R	Engine 4			
R	INT 4 MAIN HYD SUP	15-216	4K1950	A8
R	INT 4 ST'BY HYD SUP	5-213	4K1960	A6
R	AICU 4A SUP	14-216	4K2050	B5
R	AICU 4B SUP	2-213	4K2051	B14
R	Engines 1, 2, 3 and 4			
R R	HYD GRND CHECK-OUT SEL VALVE CONT	15-216	M626	F22
R R R	HYD GRND CHECK-OUT PUMP CONT	14-216	M656	A16

C. Test

R WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS
R AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT

BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT
R THE PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(1) Ensure that all equipment is clear of moving parts.

(2) Remove the locking pin from the hydraulic selector valve under test.

R (3) According to which hydraulic system is to be used
R and which spill door is being operated, remove the
R safety clip and reset the appropriate one of the
R following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(4) Make available electrical ground power as detailed in 24-41-00.

(5) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

WARNING: AFTER REMOVAL OF THE ANTI-INTERFERENCE PLATE, DO NOT LEAVE THE INTAKE MANAGEMENT PANEL UNGUARDED UNTIL THE TEST IS CONCLUDED.

(6) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "OPEN" until the spill door is 50 per cent open (approximately). Release the switch.

(7) Trip the circuit breaker set in operation (3).

(8) Refit the locking pin removed in operation (2).

(9) Reset the circuit breaker tripped in operation (7).

(10) Hold the appropriate SPILL switch at "OPEN" for 5 s and then at "SHUT" for 5 s. Check that the spill door does not move with the switch at either position. Release the switch.

(11) Trip the circuit breaker reset in operation (9).

(12) Remove the locking pin fitted in operation (8).

(13) Reset the circuit breaker tripped in operation (11).

(14) Hold the SPILL switch at "SHUT" and close the spill door. Release the switch.

(15) Hold the SPILL switch at "OPEN" and simultaneously start the stopwatch; check that the spill door is fully open (100 per cent indicated) within 7.3 to 8.2 s. Release the switch.

(16) Hold the SPILL switch at "SHUT" and simultaneously start the stopwatch; check that the spill door is fully closed (0 per cent indicated) within 10.2 to 11.8 s. Release the switch.

(17) Depressurize the hydraulic system.

(18) Switch off and disconnect electrical ground power as detailed in 24-41-00.

R (19) Trip the circuit breaker reset in operation (13)
R and fit a safety clip.

R (20) Refit the locking pin, removed in operation (12), to the selector valve.

(21) Check the selector valve and associated pipes for fluid leakage.

D. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT, THOROUGHLY CHECK THE INTAKE INTERIOR FOR DEBRIS AND LOOSE OBJECTS.

(1) Remove all tools and equipment from inside the intake, and ensure that the intake interior is clean.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) At the intake management panel, proceed as follows:-

(a) If applicable, remove the anti-interference

plate.

(b) Set the four HYD switches to "AUTO".

R (c) If applicable, set the four RAMP/SPILL MASTER
R switches to "MAN".

(4) Remove the safety clips and reset the circuit breakers previously tripped (Ref. para.B.(6)).

(5) Remove the warning placard from the engine start panel.

(6) Refit the access panels previously removed.

(7) Remove the barriers from the four intake entries, and from beneath the spill doors.

PRESSURE SWITCH - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

1. General

Three pressure switches, one for each hydraulic system (i.e., green, blue and yellow), are located together in zone 152. Access is gained after opening a door.

These procedures apply to each switch, differing only where stated.

2. Pressure Switch (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Container, for collecting hydraulic fluid	-
Torque spanner, 95 to 115 lbf in (1.073 to 1.299 mdaN)	-
Clean, lint-free cloth	-
Locking wire	-

B. Prepare

WARNING: ENSURE THAT NEITHER THE RESERVOIR NOR THE SYSTEM IS PRESSURIZED UNTIL THE WORK IS COMPLETED.

(1) Depressurize the appropriate hydraulic system and reservoir (Ref. Chap.29).

(2) Trip the circuit breakers associated with the appropriate system pressure switch and trip the circuit breakers of the hydraulic ground check-out pumps. Fit safety clips.

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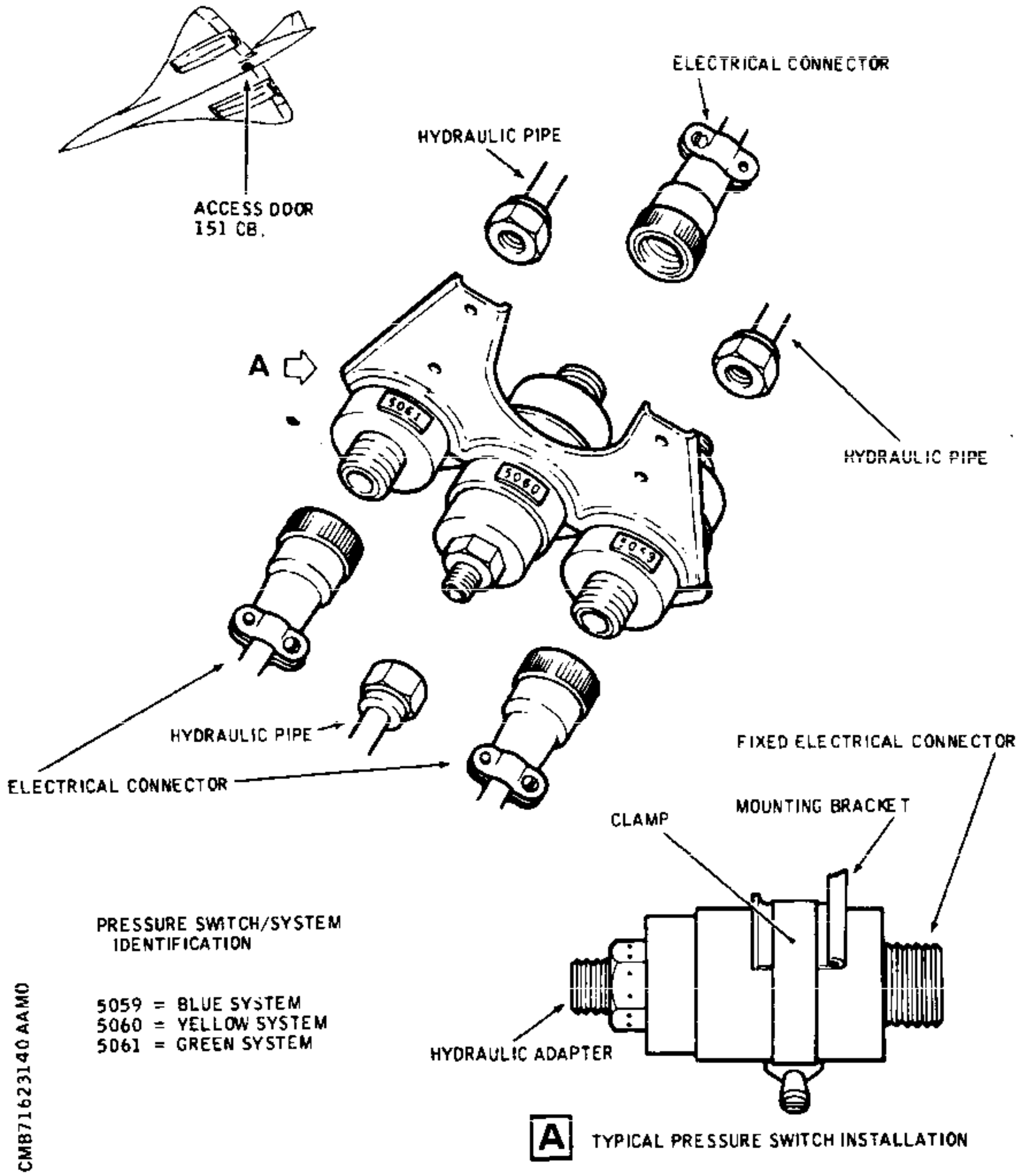


\- Pressure Switch - Installation
Figure 401

R

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Green system			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 2 MAIN HYD SUP	15-215	2K1950	B18
Blue system			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 4 MAIN HYD SUP	15-216	4K1950	A8
Yellow system			
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
All systems			
HYD GROUND CHECK OUT PUMP CONT	14-216	M656	A16
HYD GROUND CHECK OUT SEL VALVE CONT	15-216	M626	F22

(3) Open the access door 151 CB.

C. Remove

(1) Disconnect the electrical connector from the pressure switch.

(2) Loosen the clamp.

(3) Position the container to collect the residual hydraulic fluid.

(4) Restraining the pressure switch against turning (by using a spanner on the hexagon of the adapter), disconnect the hydraulic pipe.

(5) Remove the pressure switch, and immediately fit suitable blanks to the pipe and to the switch.

(6) Remove any spilled hydraulic fluid.

D. Install

(1) Ensure that the safety precautions taken in operations B.(1) and (2) have not been cancelled.

(2) Position the pressure switch in the clamp, ensuring that the electrical connector and hydraulic adapter are correctly placed.

(3) Remove the blanks from the pressure switch and pipe.

(4) Connect the hydraulic pipe to the pressure switch, hand-tightening the union nut as much as possible.

(5) Restraining the switch against turning, torque-tighten the union nut to between 95 and 115 lbf in
R (1.073 and 1.299 mdaN)

(6) Tighten the clamp.

(7) Remove the container, and remove any spilled hydraulic fluid.

(8) Connect the electrical connector to the switch, ensuring that the mating surfaces are clean and undamaged.

(9) Lock the electrical connector and the union nut with wire in accordance with 20-21-13.

E. Conclusion

(1) Remove all tools and equipment from the aircraft.

R (2) Remove the safety clips and reset the circuit
R breakers previously tripped (Ref. para.B.(2)).

R (3) Pressurize the appropriate reservoir (Ref. Chap.29).

R (4) Carry out a Functional Test as detailed in Adjustment/Test.

PRESSURE SWITCH - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

THROUGHOUT THIS TEST, HYDRAULIC PRESSURE IS APPLIED AND THE AICS CIRCUIT BREAKERS ARE SET. THEREFORE THE FOLLOWING BASIC SAFETY PRECAUTIONS MUST BE OBSERVED:-

(1) BARRIERS MUST BE POSITIONED AROUND ALL SPILL DOOR OPERATING AREAS.

(2) BARRIERS MUST BE POSITIONED OVER ALL INTAKE ENTRIES TO PREVENT PERSONS FROM ENTERING THE INTAKES.

1. General

This topic contains a Functional Test for the three pressure switches of the green, blue and yellow hydraulic systems, under the following headings:-

Functional Test - Green (Blue) Pressure Switch

Functional Test - Yellow Pressure Switch

The procedures for the green and blue systems are similar, therefore the green system instructions are first mentioned, with the differences for the blue system in brackets.

These Tests are based on the assumption that the fluid content of the hydraulic reservoirs is satisfactory, thus precluding the possibility of spurious failure indications from the low-level switches.

The test requirements for the reservoir low fluid level switches are contained in Chapter 29.

Operational and System Tests are not applicable in this instance.

2. Functional Test - Green (Blue) Pressure Switch

R A. Prepare to Test

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets)

over the four intake entries to prevent persons from entering the intakes.

(3) Display a warning placard on the engine start panel to indicate that work is in progress on the intakes.

(4) On the intake management panel (Ref. 71-61-00), set the four RAMP/SPILL MASTER switches to "MAN".

B. Test

(1) Connect hydraulic ground power rigs to the green (blue) and yellow systems (Ref. Chap.29).

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Pressurize fully the green (blue) and yellow hydraulic systems, with the application of power controlled by a responsible person associated with the test.

(4) On the intake management panel, set the HYD switches for intakes 1 and 2 (3 and 4) to "GREEN" ("BLUE"); check that the HYD failure captions on the management panel associated with the appropriate pair of intakes are extinguished. Set the four RAMP/SPILL MASTER switches to "AUTO"; check that the HYD failure captions remain extinguished.

(5) Progressively reduce the green (blue) system pressure; check that the following captions are illuminated when the pressure (indicated on the hydraulics management panel at the third crew member's station) reaches 2,000(±150) psi (140(±10) bar).

(a) HYD, for intakes 1 and 2 (3 and 4).

(b) INT, for intakes 1 and 2 (3 and 4).

(c) Master warning amber and red INT for intakes 1 and 2 (3 and 4).

(6) Press-to-cancel the red and amber INT master warning captions.

(7) Set the green (blue) HYD switch to "AUTO"; check that the INT captions for intakes 1 and 2 (3 and 4) (on the management panel) are extinguished.

(8) Restore the green (blue) system pressure to normal; check that the appropriate HYD captions remain illuminated.

(9) Set the green (blue) HYD switch to "GREEN" ("BLUE"); check that the appropriate HYD captions are extinguished.

(10) Switch off and disconnect the hydraulic ground power rigs (Ref. Chap.29).

(11) Switch off and disconnect electrical ground power as detailed in 24-41-00.

C. Conclusion

CAUTION: AFTER REMOVAL OF THE BARRIERS FROM THE FOUR INTAKE ENTRIES, THOROUGHLY CHECK THE INTAKE INTERIORS FOR DEBRIS AND LOOSE OBJECTS.

(1) Remove the barriers from the four intake entries.

R (2) On the intake management panel, proceed as
R follows:=

R (a) Set the four HYD switches to "AUTO".

R (b) Set the four RAMP/SPILL MASTER switches to
R "MAN".

(3) Remove the warning placard from the engine start panel.

(4) Remove the barriers from beneath the spill doors.

3. Functional Test - Yellow Pressure Switch

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 501.

R A. Prepare to Test

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes.

(3) Display a warning placard on the engine start

panel to indicate that work is in progress on the intakes.

(4) On the intake management panel (Ref. 71-61-00), set the four RAMP/SPILL MASTER switches to "MAN".

B. Test

(1) Connect a hydraulic ground power rig to the yellow system (Ref. Chap.29).

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Pressurize fully the yellow hydraulic system, with the application of power controlled by a responsible person associated with the test.

(4) On the intake management panel, set the four (all intakes) HYD switches to "YELLOW"; check that all HYD failure captions on the management panel are extinguished. Set the four RAMP/SPILL MASTER switches to "AUTO"; check that the HYD failure captions remain extinguished.

(5) Progressively reduce the yellow system pressure; check that the following captions are illuminated when the pressure (indicated on the hydraulics management panel at the third crew member's station) reaches 2,000(±150) psi (140(±10) bar).

(a) HYD, for intakes 1, 2, 3 and 4.

(b) INT, for intakes 1, 2, 3 and 4.

(c) Master warning amber and red INT for intakes 1, 2, 3 and 4.

(6) Restore the yellow system pressure to normal; check that the following captions are extinguished.

(a) HYD, for intakes 1, 2, 3 and 4.

(b) INT, for intakes 1, 2, 3 and 4.

(c) Master warning amber and red INT for intakes 1, 2, 3 and 4.

(7) Switch off and disconnect the hydraulic ground power rig (Ref. Chap.29).

(8) Switch off and disconnect electrical ground power as detailed in 24-41-00.

C. Conclusion

CAUTION: AFTER REMOVAL OF THE BARRIERS FROM THE FOUR INTAKE ENTRIES, THOROUGHLY CHECK THE INTAKE INTERIORS FOR DEBRIS AND LOOSE OBJECTS.

(1) Remove the barriers from the four intake entries.

R (2) On the intake management panel, proceed as
R follows:-

R (a) Set the four HYD switches to "AUTO".

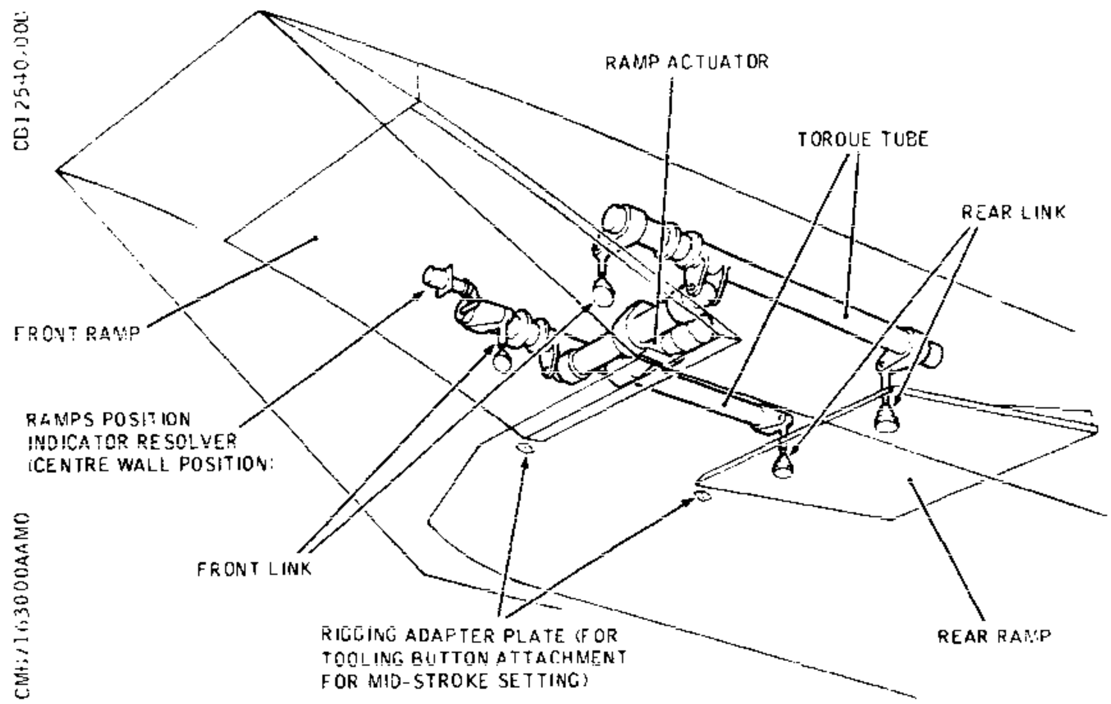
R (b) Set the four RAMP/SPILL MASTER switches to
R "MAN".

(3) Remove the warning placard from the engine start panel.

(4) Remove the barriers from beneath the spill doors.

RAMP ACTUATION - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)



- Ramp Actuation Component Location

R Figure 001

The ramp actuation mechanisms in all intakes are basically similar, the principal difference being the 'handing' of the torque tube assemblies to suit their position in the appropriate intake (Ref. Fig. 001).

A front and a rear ramp, situated in the engine air intake roof, are used, in conjunction with a spill door and auxiliary inlet vane (Ref. 71-64-00), to regulate airflow to the engine. The ramps are interconnected by torque tubes and link assemblies. A hydraulically powered ramp actuator (Ref. 71-62-00) is connected to the torque tubes and completes the ramp actuation mechanism.

Electrical signals, from the air intake control system (AICS) to the ramp actuator, control the rate of travel and position of the ramp to suit engine requirements.

Resolvers, fitted to the actuator, supply control and monitor signals to the AICS.

A position indicator resolver is driven by the centre-wall mounted torque tube to provide position signals to the position indicator mounted on the air intake management panel (Ref. 71-61-00) at the third crew member (3CM) station.

Rigging adapter plates (two for the front ramp and two for the rear ramp) are secured to the intake walls; these plates have female threads into which are screwed ground equipment tooling buttons for setting the ramps at the mid-stroke position.

Due to the severe conditions obtaining in the engine intake, small bolt and self-locking nut combinations, e.g., 0.25 in (0.635 mm) dia., and some larger bolts/nuts that are locked with split pins, are capped with sealant to reduce the chance of foreign object damage.

2. <u>Torque Tube Assemblies</u> (Ref. Fig. 002)

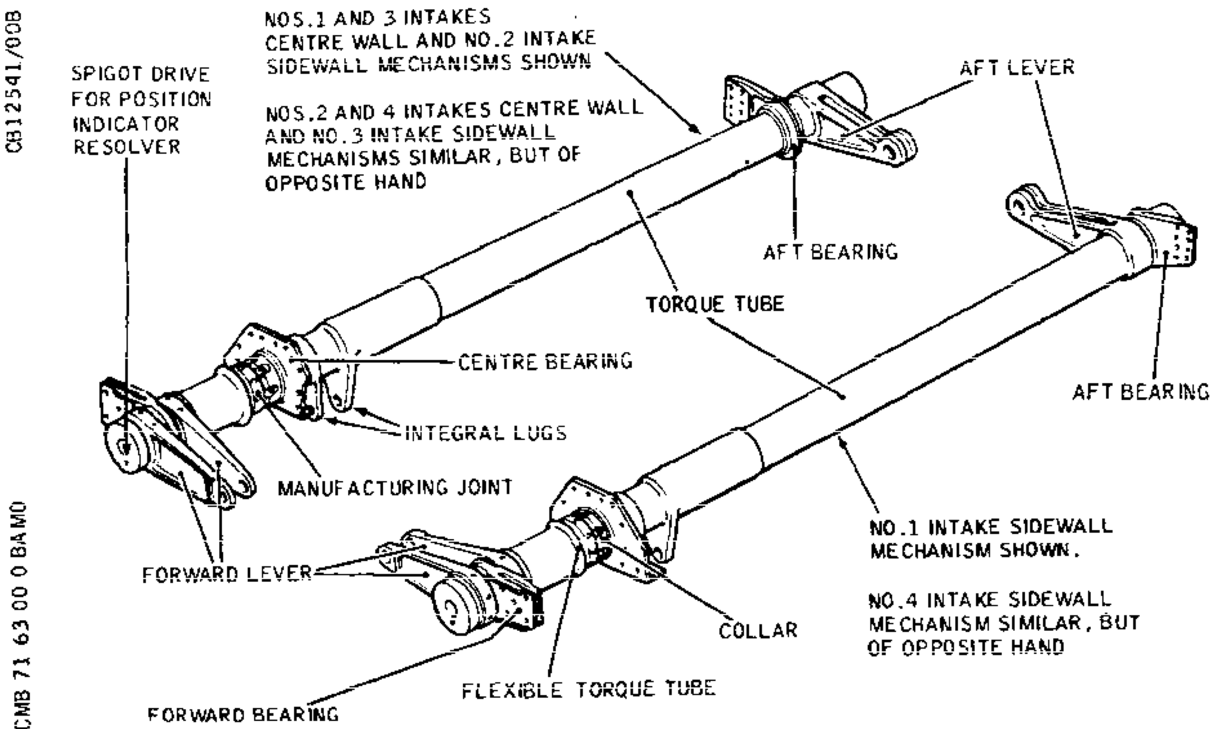
A torque tube is attached to each intake sidewall and centre wall respectively by forward, centre and aft bearing assemblies. The forward and aft bearing assemblies are bolted to brackets in the intake structure. The centre bearing is bolted to a boundary layer floor beam and locates the torque tube axially. The bearings within the bearing assemblies are lined with woven PTFE.

The tube part of the torque tube comprises two sections. A
flexible torque tube at the forward end is connected to the
main tube by a collar with swaged locking pins. The flexible
torque tube deflects slightly to absorb any abnormal airflow
R loads via the front ramp.

Two levers are attached by taper bolts to the forward end of
the torque tube. The extremities of the levers are bushed
R to provide a bearing surface for the attachment bolts of
R the front links. The forward bearing is located between
R the two levers.

Integral lugs on the torque tube near the centre bearing are provided to accept the drive from the ramp actuator. The lugs are bushed and the bushes are lined with PTFE.

An aft lever is attached to the torque tube by taper pins. The extremities of the lever are bushed to provide a bearing surface for the rear links attachment bolts.



Torque Tube Assemblies
Figure 002

The aft bearing, depending on the particular position of the torque tube in the intake, is located either forward or rearward of the aft lever.

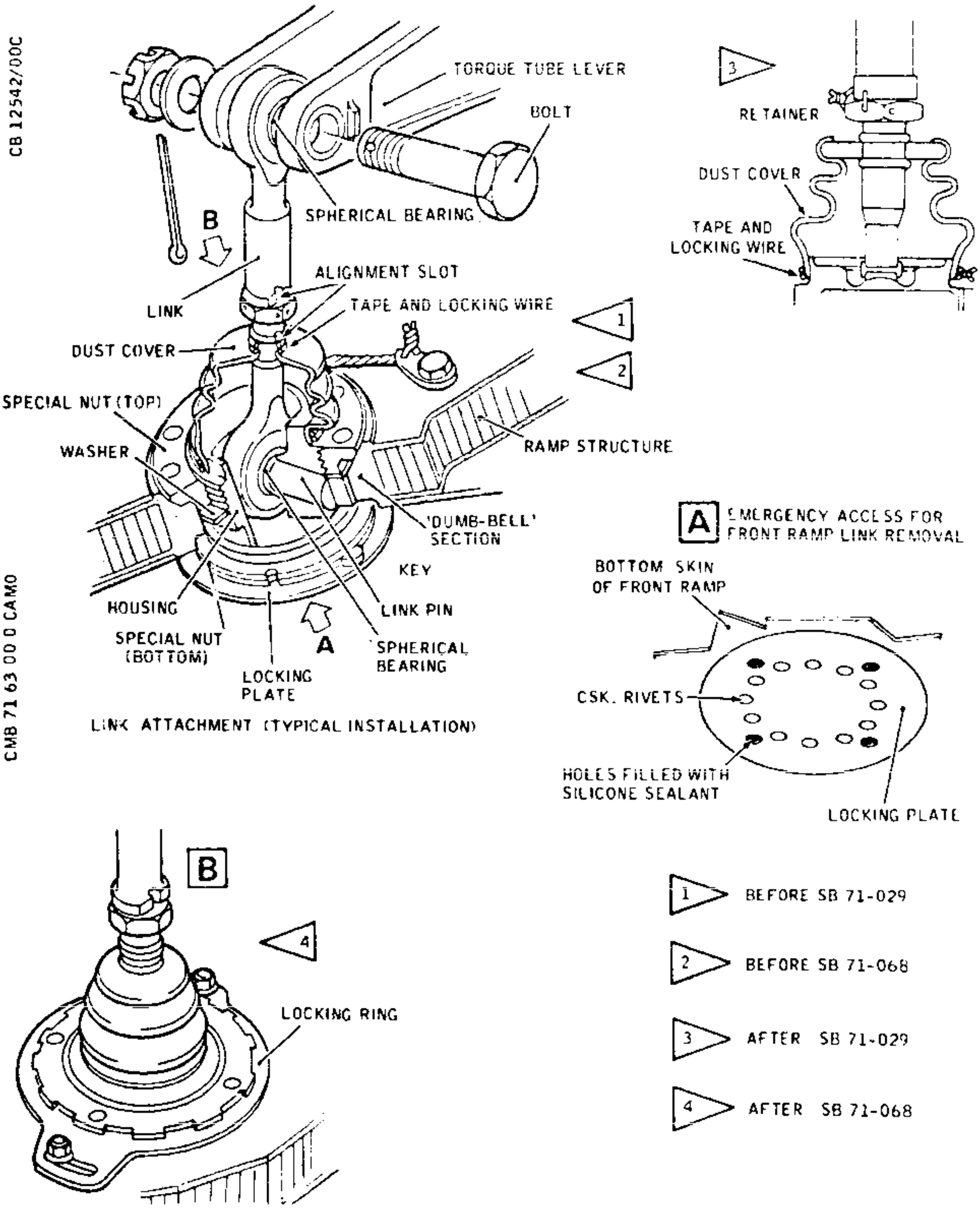
End caps are attached to each end of the torque tube. The forward end cap is drilled to accommodate a drive spigot for the position indicator resolver.

R 3. Front and Rear Ramp Links (Ref. Fig.003 and 004)

R The front and rear ramp links connect the torque tubes to
R the ramp surfaces. With the exception that the front links
R have an emergency disconnection facility, the construction
R of the front and rear links are similar.

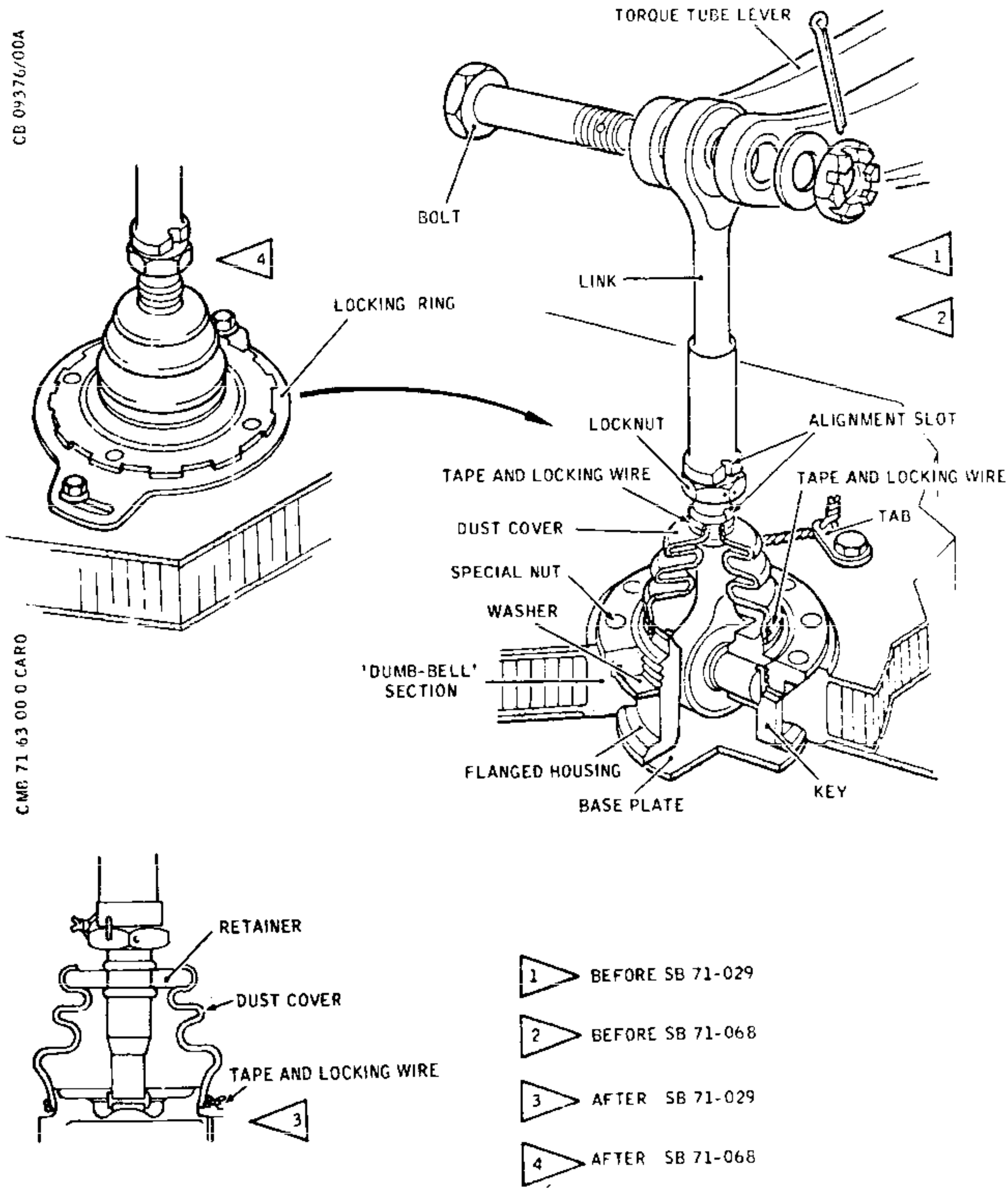
R Assembled in each end of each link is a spherical bearing. The bearing assemblies have a woven PTFE lining between the outer ring and the ball, the lining being attached to the outer ring.

The link comprises an upper and lower portion. The upper



Front Ramp Links

R Figure 003



Rear Ramp Links
R Figure 004

portion has a female thread into which is screwed the male thread of the lower portion. Both portions are locked together by a nut. A slot is engraved in each portion to ensure correct alignment of the link assembly.

The upper portion of the link is secured to the torque tube lever by a bolt, washer, nut and split pin. The lower portion of the link is secured to a housing by a link pin. The housing is located in the 'dumb-bell'
R section of the ramp (Ref.para.4) by a key which fits
R through slots in the 'dumb-bell', housing and link pin.

R In the rear ramp, the housing is flanged and abuts the bottom
R surface of the 'dumb-bell' section. It is retained by a
R special nut screwed onto the top half of the housing to abut
R the top surface of the 'dumb-bell' section.

R In the front ramp the housing is retained by a special nut
R (bottom), the flange of which abuts the bottom surface of the
R 'dumb-bell' section, and a special nut (top) which abuts the
R top surface. The special nut (bottom) is locked by a locking
R plate riveted to the bottom face of the nut. Lugs on the
R locking plate locate in slots in the bottom surface of the
R 'dumb-bell' section.

R The special nuts on the top surface of the front and rear ramps
R are each wire-locked to a tab secured to the top surface of the
R 'dumb-bell' section.

R <u>NOTE</u>: Mod 2188, if embodied, provides a second tab for
R duplicate locking at each top special nut on the front
R and rear ramps.

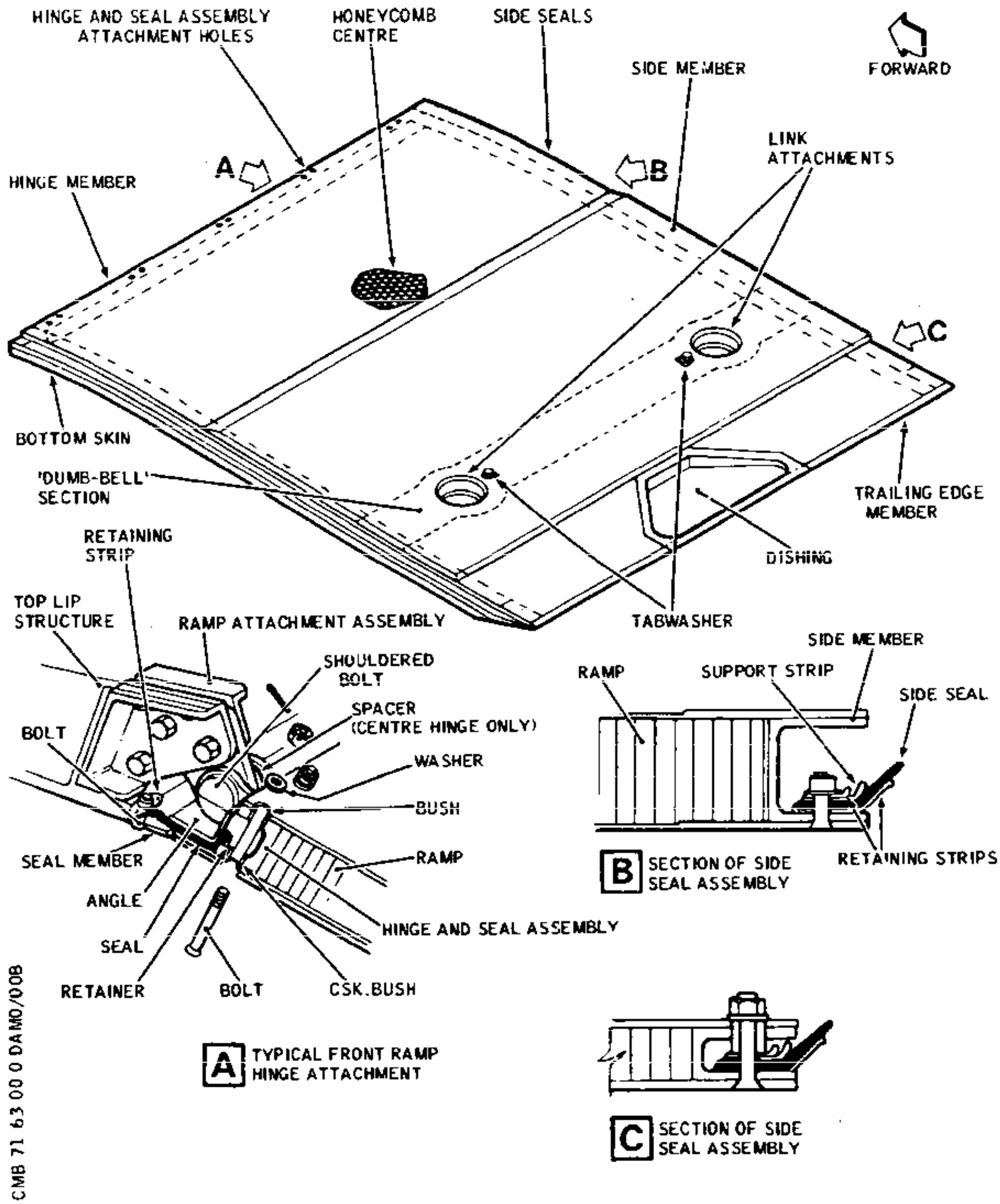
R After SB 71-068 For A/C 001-005,

R The special nuts on the top surface of the front and rear
R ramps are locked by locking rings secured to the 'dumb-
R bell'. Circumferential slots in the special nuts engage
R with lugs on the locking rings.

The lower attachments of the links are protected by dust covers.

R If the ramps fail in the up position, the actuator and
R mechanism are accessible by disconnecting the front ramp links
R from below (Ref. 71-63-12, Removal/Installation).

4. <u>Front Ramp and Attachments</u> (Ref. Fig. 005)



Front Ramp and Attachments
Figure 005

The front ramp comprises a basic slab-like structure with a metal honeycomb centre. A reinforcing member of 'dumb-bell' shape in the ramp structure provides a strong point for the attachment of link assemblies. A dishing near the trailing edge of the ramp provides clearance between the ramp top surface and the ramp actuator when the ramp is fully-up. Due to differential air pressures between the top surface of the ramp and intake below (i.e., higher air pressure at the top surface), Terylene-reinforced silicone rubber seals are attached to the side members of the ramp and below the hinges to prevent distortion of the airflow in the intake.

Five ramp attachment assemblies are bolted to the rear of the top lip structure. Each attachment comprises two brackets with a plate bolted between them. The plate has a hardened spherical hole into which a spherical bearing is fitted.

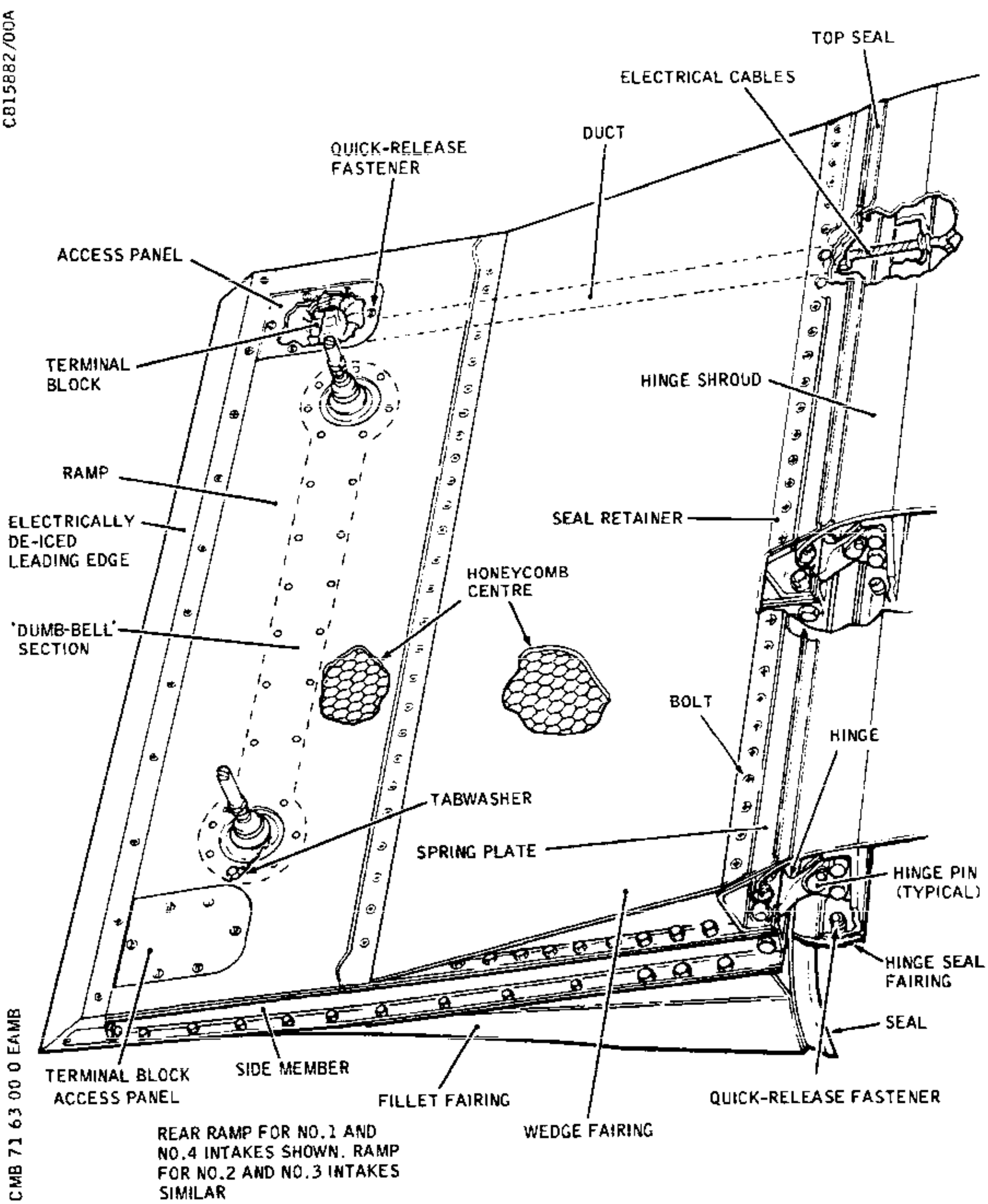
A hinge and seal assembly is attached to the five ramp attachments by shouldered bolts. The shouldered bolts are retained by self-locking nuts and split pins. The centre hinge is the datum hinge and spacers are used between the hinge and the spherical bearing to limit end-float. The hinge and seal assembly comprises five hinges to which are assembled an angle, a seal and six retainers. The angle piece is riveted to the hinges and the seal is retained by the retainers riveted to the angle. The forward end of the seal is trapped under a retaining strip. The retaining strip is secured by bolts passing through a seal member; the bolts clamp the retaining strip, seal and seal member to the top lip structure. The front ramp is bolted to the five hinges at the rearward extension of each hinge by two bolts.

Side seals are secured to the side members of the ramp by bolts clamping the support strip, retaining strips and seal together.

5. Rear Ramp and Attachments (Ref. Fig. 006)

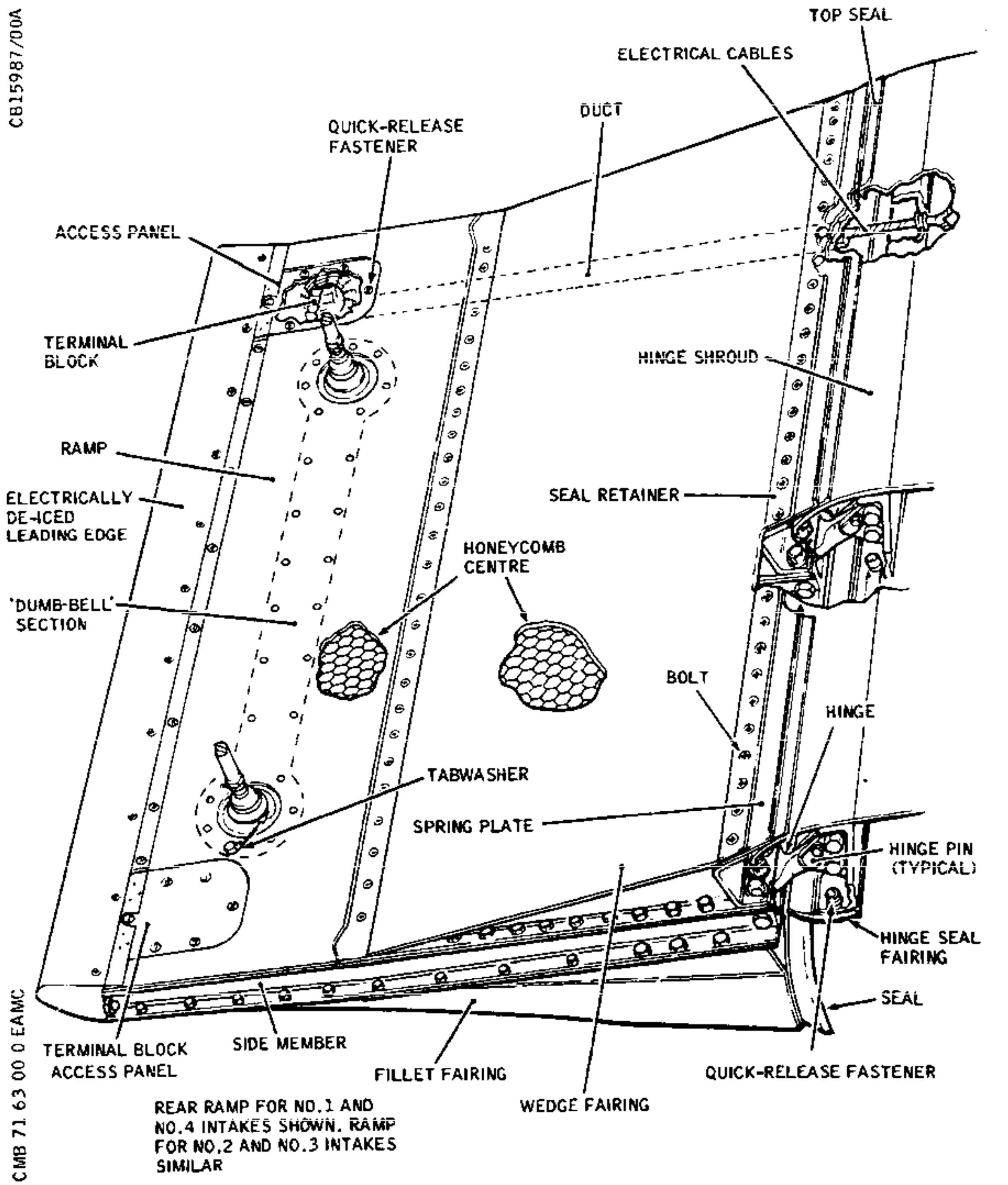
The rear ramp comprises a basic slab-like structure with a metal honeycomb centre. A reinforcing member of 'dumb-bell' shape in the ramp provides a strong point for the attachment of the link assemblies.

An electrically de-iced leading edge (Ref. 30-21-00) is bolted to the forward end of the ramp. Two small access panels at the forward end of the ramp provide access to terminal blocks associated with the leading edge. The electrical supply cables are routed rearward via a duct built into the ramp structure.



\- Rear Ramp and Attachments (Sheet 1 of 2)
Before SB 54-036

R Figure 006



- Rear Ramp and Attachments (Sheet 2 of 2)
After SB 54-036
Figure 006

R

A wedge fairing is bonded and bolted to the rear top surface of the ramp.

The fairing protects the hinges and provides a smooth air flow onto the bleed floor. Below the ramp fairing, on the bottom surface, a fillet fairing is attached to each side of the ramp. The fillet fairings blend the outside edges of the ramp surface to the intake diffuser section. At the rear of each fairing is riveted a Terylene-reinforced silicone rubber seal.

Five pairs of hinge plates are bolted to the bleed floor structure. A hinge which contains a spherical bearing is fitted between each pair of plates. The centre hinge is the datum hinge, and spacers and shims are used between the hinge plates and spherical bearing to limit end-float of the ramp. The ramp is secured to the forward extension of each hinge by two bolts.

The ramp hinges are protected and faired in by flexible seal assemblies. A hinge shroud, riveted to the bleed floor structure, provides a bearing surface for the top seal. The top seal, stiffened by a spring plate and seal retainer, is bolted to the top rear edge of the wedge fairing.

6. Position Indicator Resolver (Ref. Fig. 007)

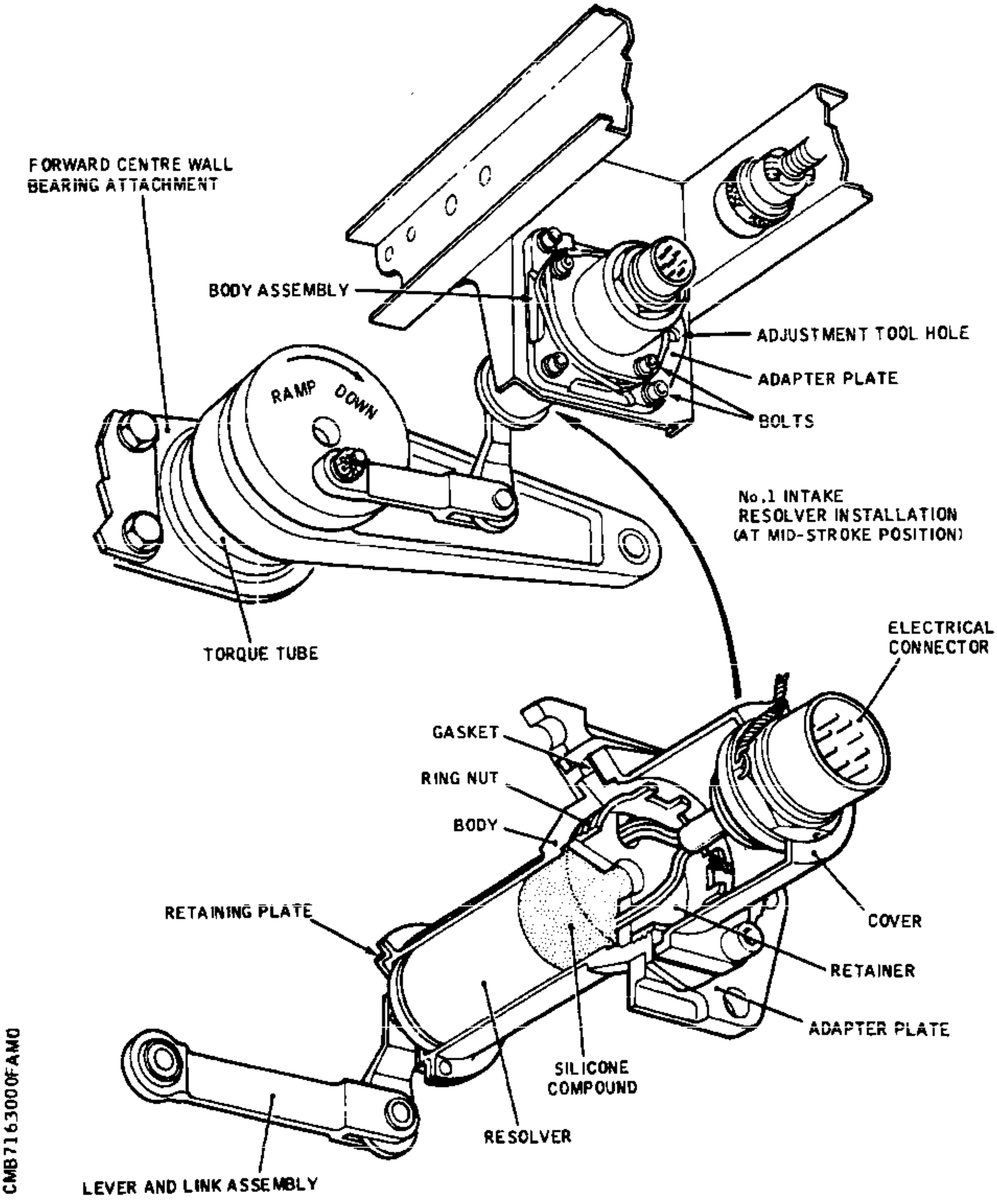
A position indicator resolver assembly is mounted in the roof of the intake forward of the centre-wall mounted torque shaft. The resolver is driven by a lever and link assembly attached to a spigot screwed into the forward end cap of the torque tube.

The position of the resolver relative to its mounting (adapter plate) is adjustable.

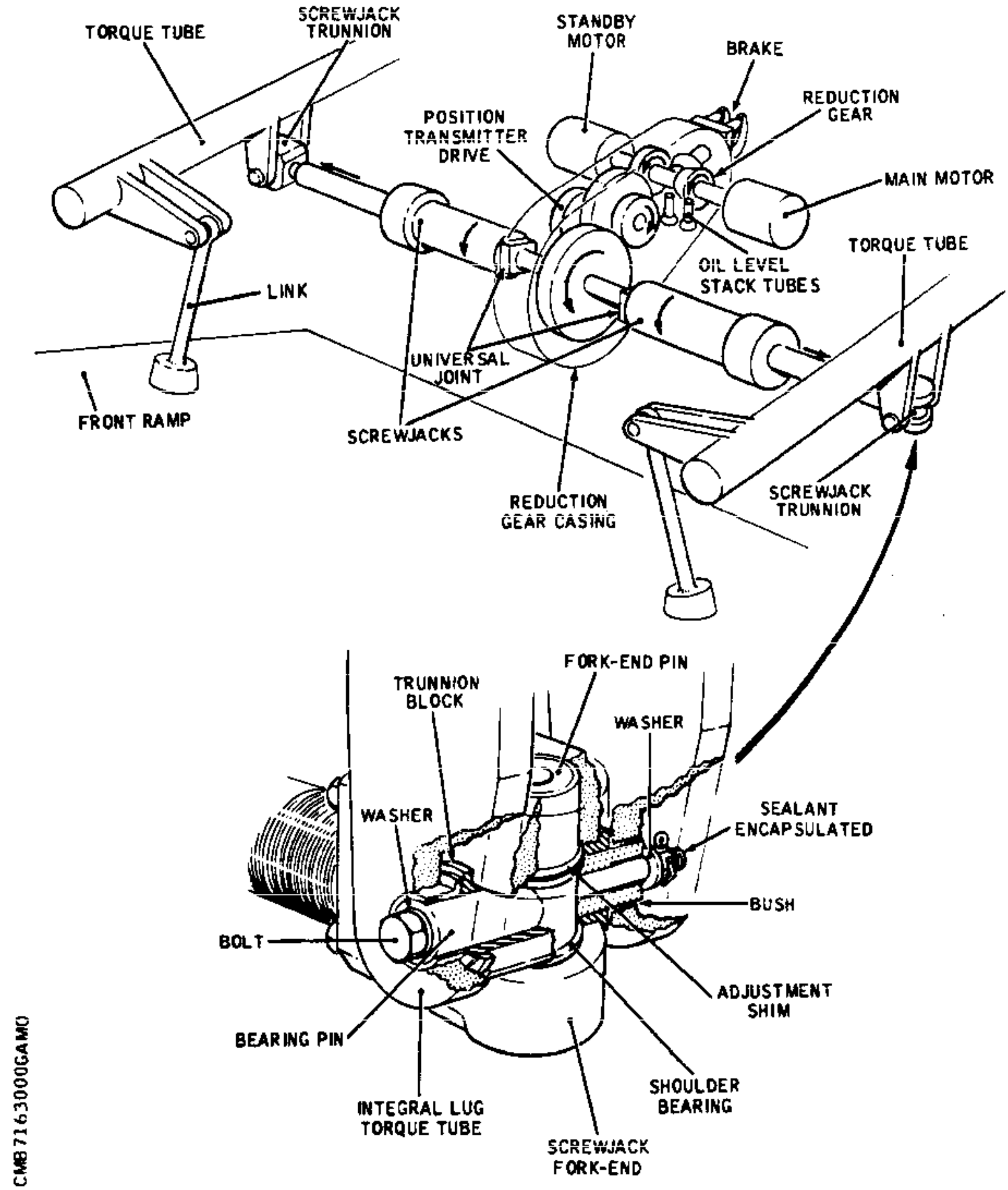
7. Ramp Actuator (Ref. Fig. 008)

A ramp actuator is attached to brackets in the roof of the intake by links and bolts, and is braced by a side stay.

Two screwjacks are driven via reduction gears, by the main or standby group of hydraulic components (Ref. 71-62-00), to raise or lower the ramps. The reduction gear casing contains an oil bath. An oil filler and level plug, connected to internal stack pipes, are located in the bottom of the gearcase. A mechanically operated disc brake locks the ramp actuator until hydraulic power and electrical power are applied to operate the actuator.



- Position Indicator Resolver
Figure 007



- Ramp Actuation Schematic and Trunnion Detail
Figure 008

Each screwjack is connected to the torque tubes by a trunnion assembly. The screwjack fork-end contains two PTFE-lined shoulder bearings. Fitting between the shoulder bearings and fork-end are adjustment shims, and a fork-end pin fits through the shoulder bearings. The fork-end pin also passes through a vertical hole in the trunnion block. Two bearing pins are fitted through the integral lugs of the torque tube, into the trunnion block and against the fork-end pin. The bearing pins have an extractor thread at one end and the other end is concave to match the periphery of the fork-end pin. The bearing pins and fork-end pin are retained in position by a bolt, nut and split pin.

8. Operation (Ref. Fig. 008)

A. Control and Indication

For control and indication refer to 71-61-00.

B. Functional Description

With electrical power and hydraulic power available, operation of the ramps is controlled by electrical signals from the AICS (or manual inching facility) which direct the hydraulic pressure within the actuator (Ref. 71-62-00) to extend or retract the screwjacks.

The movement of the actuator screwjacks rotates the torque tubes and, through the links, raises or lowers the front and rear ramps simultaneously.

With the movement of the ramps, associated resolvers for two independent electrical functions are operated, namely, the resolvers fitted to the actuator, which supply control and monitor signals to the AICS, and the position indicator resolver, which supplies signals to a ramps position indicator.

In the event of one hydraulic or one electrical system failure, the alternative hydraulic or electrical system takes over automatically. Complete hydraulic or electrical failure results in the ramp being locked, in that position where the failure occurred, by the actuator brake.

RAMP ACTUATION - SERVICING

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

This topic contains the procedures for operating the ramps.

The procedures required to lower and to raise the ramps are almost identical; where differences occur, the instructions to lower the ramps are first mentioned, with the differences required to raise the ramps immediately following, in brackets.

Control and indication is effected at the intake management panel (Ref. 71-61-00) in the flight compartment.

Indication of the ramps position is shown as a percentage (0 per cent, fully raised; 100 per cent, fully lowered).

2. Ramps Manual Control Procedure

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000

B. Prepare

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out in the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) If applicable set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1

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SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

C. Lower (Raise) Ramps

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(1) Ensure that all equipment is clear of moving parts.

(2) According to which hydraulic system is to be used and which ramps are being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(5) At the intake management panel, remove the anti-interference plate. Using the appropriate RAMP switch in an inching mode, move the switch to LOWER (RAISE) until the ramps are at the required position. Release the switch.

(6) Depressurize the hydraulic system.

(7) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(8) Trip the circuit breaker reset in operation (2) and fit a safety clip.

(9) Refit, and lock, the anti-interference plate to the intake management panel.

D. Conclusion

(1) Fully raise the ramps by carrying out operations C.(1) to (9). When carrying out operation C.(5), hold the appropriate RAMP switch at RAISE until the ramps are fully raised.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (2), THOROUGHLY CHECK THE INTAKE

INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(2) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(3) Remove the locking pins from the hydraulic selector valves of the four intakes.

(4) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.B.(6) and (7)).

(5) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) Leave the four RAMP/SPILL MASTER switches at the MAN position.

(c) Set the four HYD switches to "AUTO".

(6) Remove the warning placard from the engine start panel.

(7) Remove the barriers from beneath the four spill doors and from the intake entries.

RAMP ACTUATION - INSPECTION/CHECK

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

IN ADDITION, IT MUST BE ENSURED THAT HYDRAULIC POWER IS NOT APPLIED TO THE APPROPRIATE MAIN (GREEN OR BLUE) SYSTEM AND THE STANDBY (YELLOW) SYSTEM.

1. General

This topic contains the inspection and check procedures for the ramps, mechanism and actuator under the following headings:-

Ramps Mechanism Backlash Check

Rear Ramp Hinge Wear Check

Actuator Screwjack Threads Inspection

Actuator Operating Rate and Snubbing Check (using AICS inching facility)

Ramp Seals Inspection

R Ramp Link Special Nut (Top) Torque Check

The procedures apply to all intakes unless otherwise stated.

2. Ramps Mechanism Backlash Check

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Protective cover, for intake lip	D926806000
Servicing extension (springboard)	-
Work stand	-
Crawling board	-
Cover, for engine transition ring	D935036001
Dial test indicator (DTI)	-

B. Prepare to Check Ramps Mechanism Backlash

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out in the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

	SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
	Engine 1			
	INT 1 MAIN HYD SUP	1-213	1K1950	D9
R	INT 1 STBY HYD SUP	15-216	1K1960	B8
	AICU 1A SUP	2-213	1K2050	D14
	AICU 1B SUP	14-216	1K2051	A5
	Engine 2			
	INT 2 MAIN HYD SUP	15-215	2K1950	B18
R	INT 2 STBY HYD SUP	1-213	2K1960	E9
	AICU 2A SUP	13-216	2K2050	A3
	AICU 2B SUP	2-213	2K2051	H14
	Engine 3			
	INT 3 MAIN HYD SUP	5-213	3K1950	A7
R	INT 3 STBY HYD SUP	15-215	3K1960	C18
	AICU 3A SUP	2-213	3K2050	H13
	AICU 3B SUP	13-216	3K2051	B3
	Engine 4			
	INT 4 MAIN HYD SUP	15-216	4K1950	A8
R	INT 4 STBY HYD SUP	5-213	4K1960	A6
	AICU 4A SUP	14-216	4K2050	B5
	AICU 4B SUP	2-213	4K2051	B14
	Engines 1, 2, 3 and 4			
	HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

(8) Set the ramps to the mid-stroke (50 per cent indicated) position (approximately) as follows:-

<u>WARNING:</u> ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THOSE CIRCUIT BREAKERS RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) According to which hydraulic system is to be used and which ramps are being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(c) Make available electrical ground power as detailed in 24-41-00.

(d) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(e) At the intake management panel, remove the anti-interference plate; hold the appropriate RAMP switch at "LOWER" until the ramps are approximately at the mid-stroke position. Release the switch.

(f) Depressurize the hydraulic system.

(g) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(h) Trip the circuit breaker reset in operation (b) and fit a safety clip.

(i) Refit, and lock, the anti-interference plate to the intake management panel.

R (9) Check personal clothing for potential loose articles before entering the intake (Ref. 71-00-00, Servicing).

R (10) Fit, and secure, the protective cover to the intake lip (Ref. 71-00-00, Servicing).

R (11) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

R (12) Place the crawling board on the floor of the intake, aft of the servicing extension.

R (13) Fit the cover to the engine transition ring.

C. Check Ramps Mechanism Backlash

(1) Check the backlash, as follows:-

(a) Position a dial test indicator (DTI), rigidly supported, under one front ramp link, at its attachment point to the ramp.

(b) Hold the associated side of the rear ramp down and set the DTI at zero.

(c) Move, and hold, the rear ramp up; check that the free movement, indicated on the DTI, is not more than 0.050 in (1.270 mm).

(d) Repeat operations (a) to (c) at the other front ramp link.

(e) Position the DTI under one rear ramp link, at its attachment point to the ramp.

(f) Hold the associated side of the front ramp down and set the DTI at zero.

(g) Move, and hold, the front ramp up; check that the free movement, indicated on the DTI, is not more than 0.050 in (1.270 mm).

(h) Repeat operations (e) to (g) at the other rear ramp link.

(2) Remove the dial test indicator.

(3) Carry out operation B.(8), but fully raise the ramps.

D. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (1), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE
R OBJECTS. IN ADDITION THE INTAKE MUST BE
R VACUUM CLEANED.

(1) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.B.(6) and (7)).

(4) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(c) Set the four HYD switches to "AUTO".

(5) Remove the warning placard from the engine start panel.

(6) Remove the barriers from beneath the four spill doors and from the intake entries.

3. Rear Ramp Hinge Wear Check (Ref. Fig. 601)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 601.

CAUTION: THE RAMPS ARE BONDED HONEYCOMB STRUCTURES AND MUST BE TREATED WITH CARE TO AVOID DAMAGE.

A. Equipment and Materials

	DESCRIPTION	PART NO.
R	Circuit breaker safety clips	-
R	Locking pins for selector valves	E925037000
R	Locking pins for selector valves	E925038000

DESCRIPTION	PART NO.
R Anti-interference plate, for R intake management panel	E925068000
R Protective cover for intake lip	D926806000
R Servicing extension (springboard)	-
R Work stand	-
R Crawling board	-
R Cover for engine transition ring	D935036001
R Dial test indicator (DTI) and R support equipment	
Slip gauges	-
R 'Kimwipe' tissues, or clean lint-free cloth	-
R Never-Seez Grease (Ref.20-30-00, R No.62)	CM145

B. Prepare to Check Rear Ramp Hinge Wear

R (1) Carry out operations 2.B.(1) to (13), but fully raise the ramps in operation 2.B.(8).

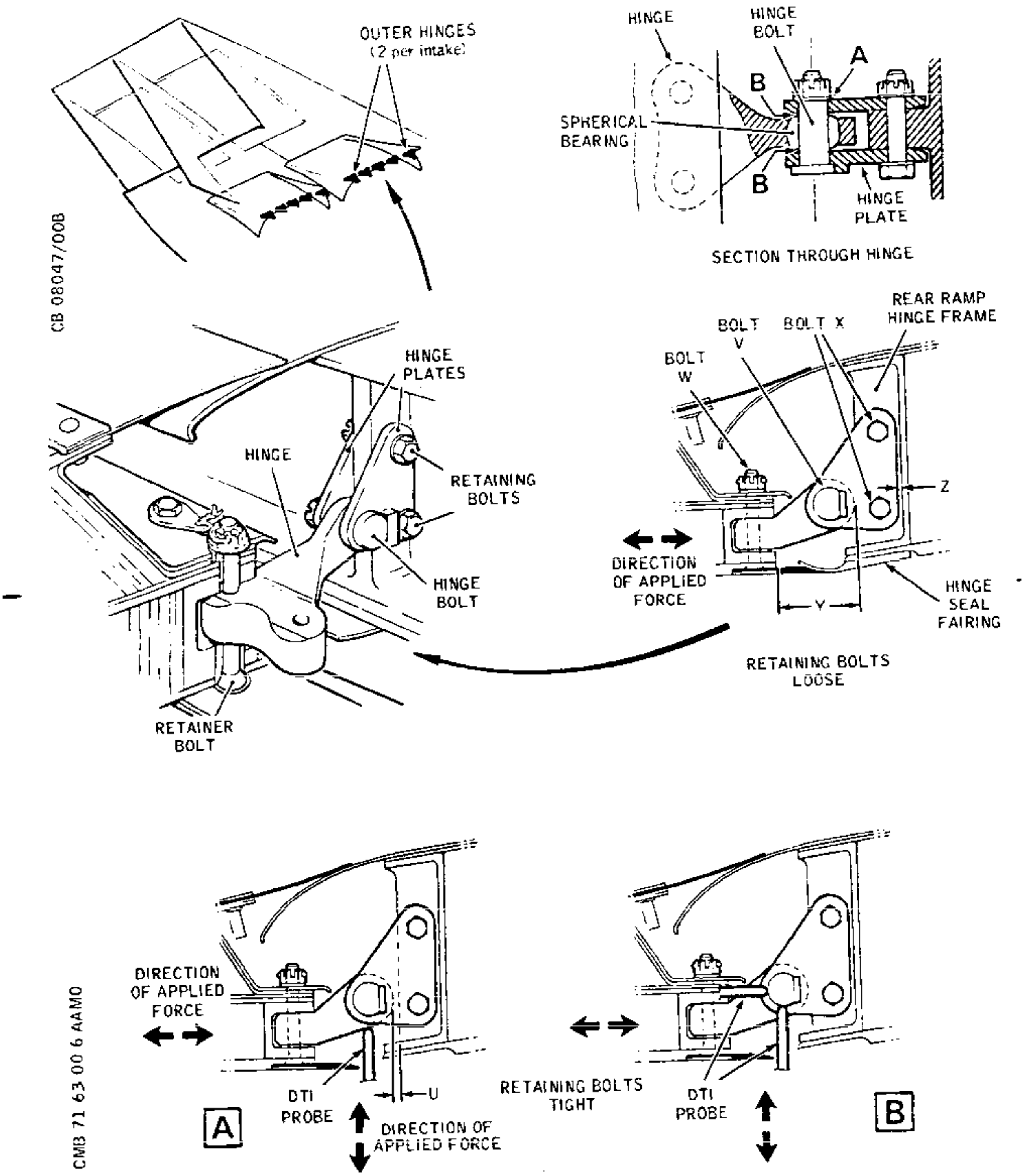
(2) Remove the hinge seal fairing from beneath the rear ramp hinges.

C. Check Rear Ramp Hinge Wear

NOTE: The two outer hinges of each rear ramp are checked for wear, as these hinges receive the greater loading during service.

(1) Remove the split pins, nuts, washers and bolts V from the three central hinges. Record the positions of, and retain, the spacing washers and, if fitted, spacer/shims from the centre hinge.

(2) Check that the bolts W and X of each outer hinge



Rear Ramp Hinge Wear Check
Figure 601

are tight and that their locking devices are intact. If the bolts are loose, proceed as follows:-

NOTE: Worn parts must be renewed. If the ramp, hinges, hinge plates or rear ramp hinge frame are damaged, reference must be made to the Structural Repair Manual.

(a) Support the ramp. Remove the bolts W, X and V from each outer hinge in turn. Visually inspect all parts for damage, including the ramp in the vicinity of the hinges. Renew parts as necessary.

(b) Smear Never-Seez grease on the spherical bearing of each outer hinge.

(c) Position the hinges and hinge plates and fit the bolts W, X and V, washers and nuts; hand-tighten the nuts at this stage.

(d) Manually, move the ramp forward and rearward, recording, at the extremes of movement, dimensions Y and Z, at each outer hinge. From the recorded dimensions calculate the radial clearance in the retaining bolt holes; the maximum permissible clearances are as follows:-

d1) For bolts X: 0.005 in (0.127 mm).

d2) For bolts W: 0.006 in (0.152 mm).

(e) Torque-tighten the nuts of bolts V, W and X and secure them in accordance with 54-21-25, Removal/Installation.

(3) Remove all surplus grease from the outer hinges (using Kimwipe tissues or clean lint-free cloth). Check that -

(a) gap A (bolt end-float) is at least 0.002 in (0.051 mm), and

(b) gap B, at each side of the bearing, is at least 0.020 in (0.508 mm).

(4) Check for radial clearance at the hinge bolt (Detail A) of each outer hinge, as follows:-

(a) Manually, move the ramp forward and rearward

and measure dimension U at the extremes of movement, using slip gauges. Record the difference between the two measurements.

(b) Position a DTI, rigidly attached to a fixed structure, as shown in Detail A.

(c) Manually, move the ramp vertically up and down in the vicinity of the hinge; record the difference between the DTI readings at the extremes of movement.

(d) From the measurements recorded, calculate the radial clearance; this clearance must not exceed 0.007 in (0.178 mm).

(5) If the radial clearance at either outer hinge bolt exceeds 0.007 in (0.178 mm), establish the point of wear (Ref. Detail B), as follows:-

(a) Position a DTI, rigidly attached to a fixed structure, at each of the two positions illustrated.

(b) Manually, move the ramp forward and rearward, and vertically up and down in the vicinity of the hinge; take DTI readings at the extremes of movement and record them. Calculate the hinge bolt to hinge plates radial clearance; this clearance must not exceed 0.004 in (0.102 mm).

(c) If the hinge bolt/hinge plates radial clearance exceeds 0.004 in (0.102 mm), renew the hinge bolt and/or hinge plates.

(d) If the hinge bolt/hinge plates radial clearance is less than 0.004 in (0.102 mm), renew the hinge or the spherical bearing in the hinge.

(e) Repeat operation (4) to recheck the total radial clearance.

(6) Install the three central hinges and the hinge seal fairing (Ref. 54-21-25, Removal/Installation).

D. Conclusion

<u>CAUTION</u>: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (1), THOROUGHLY CHECK THE INTAKE

INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE
R OBJECTS. IN ADDITION THE INTAKE MUST BE
R VACUUM CLEANED.

(1) Remove all tools and equipment from the intake and ensure that the intake interior is clean.

(2) Carry out a Functional Test as detailed in 71-63-12, Adjustment/Test.

4. Actuator Screwjack Threads Inspection

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 601.

A. Equipment and Materials

	DESCRIPTION	PART NO.
R	Circuit breaker safety clips	-
R	Locking pins for selector valves	E925037000
R	Locking pins for selector valves	E925038000
R R	Anti-interference plate, for intake management panel	E925068000
R	Protective cover, for intake lip	D926806000
R	Servicing extension (springboard)	-
R	Work stand	-
R	Crawling board	-
R	Cover, for engine transition ring	D935036001
R R	'Kimwipe' tissues, or clean lint-free cloth	-

B. Prepare to Inspect Actuator Screwjack Threads

R (1) Carry out operations 2.B.(1) to (13), but fully lower the ramps in operation 2.B.(8).

C. Inspect Actuator Screwjack Threads

(1) Remove all grease from the threads of both screwjacks,

R using clean 'Kimwipe' tissues or suitable alternative.

(2) Inspect the threads for -

(a) freedom from damage and for

(b) silver colour throughout their whole length.

(3) If the threads are chipped or otherwise damaged or are straw or blue in colour, at any point along their length, renew the screwjack (Ref. 71-63-11).

(4) If the screwjack threads are satisfactory, lubricate them as detailed in 12-22-71.

(5) Carry out operation 2.B.(8), but fully raise the ramps.

D. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (1), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE
R OBJECTS. IN ADDITION THE INTAKE MUST BE
R VACUUM CLEANED.

(1) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(4) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(c) Set the four HYD switches to "AUTO".

(5) Remove the warning placard from the engine start panel.

(6) Remove the barriers from beneath the four spill doors and from the intake entries.

5. Actuator Operating Rate and Snubbing Check

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 601.

A. Equipment and Materials

	DESCRIPTION	PART NO.
R	Circuit breaker safety clips	-
R	Locking pins, for selector valves	E925037000
R	Locking pins, for selector valves	E925038000
R R	Anti-interference plate, for intake management panel	E925068000
R	Stopwatch	-

B. Prepare to Check Actuator Operating Rate and Snubbing

(1) Carry out operations 2.B.(1) to (7).

C. Check Actuator Operating Rate and Snubbing

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THOSE CIRCUIT BREAKERS RESET IN THE FOLLOWING PROCEDURES.

(1) Ensure that all equipment is clear of moving parts.

(2) According to which hydraulic system is to be used and which ramps are being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.2.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP

(3) Remove the anti-interference plate from the intake management panel.

(4) Make available electrical ground power as detailed in 24-41-00.

(5) Pressurize the appropriate hydraulic system to the normal operating pressure (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intake.

(6) On the intake management panel, hold the appropriate RAMP switch at "LOWER"; check that the ramps move smoothly and that snubbing occurs just before the ramps are fully lowered. Release the switch.

NOTE: Snubbing is recognized by the sudden reduction in the rate of the ramps movement as the actuator nears its end-of-stroke position. If snubbing is not evident, the fault must be rectified before proceeding.

(7) Hold the appropriate RAMP switch at "RAISE"; check that the ramps move smoothly and that snubbing occurs just before the ramps are fully raised. Release the switch.

(8) Hold the appropriate RAMP switch at "LOWER" and simultaneously start the stopwatch; check that the ramps are fully lowered, including snubbing, between 4.9 and 5.4 s. Release the switch.

(9) Hold the RAMP switch at "RAISE" and simultaneously start the stopwatch; check that the ramps are fully raised, including snubbing, between 7.5 and 8.9 s. Release the switch.

(10) Depressurize the hydraulic system.

(11) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(12) Refit, and lock, the anti-interference plate to the intake management panel.

(13) Trip the circuit breaker reset in operation (2) and fit a safety clip.

D. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (1), THOROUGHLY CHECK THE INTAKE INTERIOR FOR DEBRIS AND LOOSE OBJECTS.

(1) Remove all tools and equipment from the intake and ensure that the intake interior is clean.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) At the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) Set all HYD switches to "AUTO".

(c) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(4) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(5) Remove the warning placard from the engine start panel.

(6) Remove the barriers from the intake entries and from beneath the spill doors.

6. Ramp Seals Inspection

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 601.

R A. Equipment and Materials

	DESCRIPTION	PART NO.
R	Circuit breaker safety clips	-
R	Locking pins for selector valves	E925037000
R	Locking pins for selector valves	E925038000
R R	Anti-interference plate, for intake management panel	E925068000
R	Protective cover, for intake lip	D926806000
R	Servicing extension (springboard)	-
R	Work stand	-
R	Crawling board	-

DESCRIPTION	PART NO.
R Cover, for engine transition ring	D935036001

R B. Prepare to Inspect Ramp Seals

R (1) Carry out operations 2.B.(1) to (13).

R C. Inspect Ramp Seals

(1) Inspect the seals, and the dust covers on the links, for security and freedom from cuts.

(2) Carry out operation 2.B.(8), but fully raise the ramps.

R D. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (1), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE
R OBJECTS. IN ADDITION THE INTAKE MUST BE VACUUM
R CLEANED.

(1) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(4) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(c) Set the four HYD switches to "AUTO".

(5) Remove the warning placard from the engine start panel.

(6) Remove the barriers from beneath the four spill doors and from the intake entries.

7. Ramp Link Special Nut (Top) Torque Check - Front/Rear Ramps

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 601.

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Protective cover, for intake lip	D926806000
Servicing extension (springboard)	-
Work stand	-
Crawling board	-
Cover, for engine transition ring	D935036001
Torque spanner, 1,400 to 1,500 lbf in (15.82 to 16.95 mdaN)	-
Adapter	D925088001
Setting piece	D925089000
Locking wire 0.031 in (0.8mm)	DTD189

B. Prepare to Check Torque on Ramp Link Special Nut (Top)

(1) Carry out operation 2.B. complete, but fully lower the ramps Ref.para.2.B.(8)).

C. Check Torque on Ramp Link Special Nut (Top)

NOTE: The following procedure is applicable to all ramp links.

(1) Check the special nut (top) for loss of torque

R loading, indicated by stretched or broken locking
R wire.

R (2) If the locking wire is stretched or broken:

R (a) Remove the locking wire from the special nut and
R locking tab(s). Recover all the locking wire.

R NOTE: Mod.2188, if embodied, provides an additional
R tab for duplicate locking.

R (b) Unscrew the special nut one half-turn, using
R the adapter.

R (c) Set the torque spanner to between 1,400 and
R 1,500 lbf in (15.82 and 16.95 mdaN), using
R the setting piece.

R (d) Torque-tighten the special nut to between
R 1,400 and 1,500 lbf in (15.82 and 16.95 mdaN),
R using the adapter.

R (3) Wire-lock the special nut to the locking tab(s) in
R accordance with 20-21-13.

R (4) Re-set the ramp position as in operation 2.B.(8),
R but fully raise the ramps.

R D. Conclusion

R CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION
R (1), THOROUGHLY CHECK THE INTAKE INTERIOR FOR
R FREEDOM FROM DEBRIS AND LOOSE OBJECTS. IN
R ADDITION THE INTAKE MUST BE VACUUM CLEANED.

R (1) Remove all tools and equipment from inside the intake
R and ensure that the intake is clean.

R (2) Remove the locking pins from the hydraulic selector
R valves of the four intakes.

R (3) Remove the safety clips and reset the circuit breakers
R previously tripped (Ref. paras.2.B. (6) and (7)).

R (4) On the intake management panel, proceed as follows:

R (a) Remove the anti-interference plate.

R (b) If applicable, set the four RAMP/SPILL MASTER
R switches to "MAN".

R (c) Set the four HYD switches to "AUTO".

R (5) Remove the warning placard from the engine start
R panel.

R (6) Remove the barriers beneath the four spill doors and
R from the intake entries.

END OF THIS SECTION

NEXT

RAMP ACTUATOR - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

R IN ADDITION, IT MUST BE ENSURED THAT HYDRAULIC POWER
R IS NOT APPLIED TO THE APPROPRIATE MAIN (GREEN OR BLUE)
R SYSTEM AND THE STANDBY (YELLOW) SYSTEM.

1. General

A ramp actuator is fitted in each engine air intake above the front ramp. Access to the actuator is gained by entering the intake and disconnecting the front ramp links from the torque tubes and lowering the ramp. The removal and installation of the four actuators is similar. The actuator weighs 93 lb (42.2 kg) approximately.

This topic contains the removal and installation procedures for the actuator as a whole, and those for various parts of the actuator whilst it is installed in the aircraft. The procedures are under the following headings:-

Ramp Actuator

Screwjack

Hydraulic Motor

Snubbing Device

Solenoid and Distributor

Servo Valve

Resolver Unit

2. Ramp Actuator (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Containers, for hydraulic fluid	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Resolver test set (includes power loom Pt. No.TE6049201 and ramp resolvers loom Pt. No.TE6049202) resolver settings	TE6049000
R R Grease (Never-Seez) (Ref. 20-30-00, No. 62)	CM145
Lifting equipment, for actuator	E935044000
Protective cover, for intake lip	D926806000
Servicing extension (springboard)	-
Crawling board	-
Work stand	-
Cover, for engine transition ring	D935036001
Circuit breaker safety clips	-
Support block (front ramp)	D925453000
Support block (rear ramp)	D925453001
R R Torque spanner, 12 to 15 lbf in (0.136 to 0.169 mdaN)	

DESCRIPTION	PART NO.
Torque spanner, 25 to 30 lbf in (0.282 to 0.339 mdaN)	-
Torque spanner, 34 to 43 lbf in (0.384 to 0.486 mdaN)	-
Torque spanner, 36 to 44 lbf in (0.407 to 0.497 mdaN)	-
Torque spanner, 50 to 60 lbf in (0.565 to 0.678 mdaN)	-
Torque spanner, 133 to 177 lbf in (1.503 to 2.000 mdaN)	-
Torque spanner, 160 to 180 lbf in (1.808 to 2.034 mdaN)	-
Torque spanner, 215 to 240 lbf in (2.429 to 2.712 mdaN)	-
Torque spanner, 300 to 420 lbf in (3.390 to 4.746 mdaN)	-
Extractor, for trunnion block bearing pin	E925032000
Ramp actuator gauge (mid-stroke setting)	E925053000
Brake release tool	E925089000
Kimwipe tissues, or clean lint-free cloth	-

B. Prepare to Remove Actuator

(1) Ensure that the four intakes are clear of personnel and equipment.

(2) Position barriers to prevent persons from inadvertently entering the areas below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes, particularly when hydraulic power is

applied.

(3) Display a warning placard on the engine start panel at the third crew member's (3CM) station to indicate that work is being carried out inside the engine intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Ensure that the four RAMP/SPILL MASTER switches are at the MAN position.

(b) Set the appropriate HYD switch to the hydraulic system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins to the spill door hydraulic selector valves of all intakes (Ref. 71-62-00, Servicing).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18

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SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

(8) Fit, and secure, the protective cover to the intake lip.

(9) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(10) Place the crawling board on the floor of the intake, aft of the servicing extension.

(11) Fit the cover to the engine transition ring.

(12) Set the actuator to the mid-stroke position

(approximately), as follows:-

(a) Remove the brake release access plug from the brake unit on the actuator.

(b) Using the brake release tool as detailed on the attached label, disengage the brake.

(c) Rotate the screwjack bodies until the actuator is at the mid-stroke (approximately) position.

(d) Using the brake release tool in the reverse order of operation (b), engage the brake. Remove the tool from the actuator.

(e) Refit the plug to the brake unit on the actuator. Torque-tighten the plug to between 133 and 177 lbf in (1.503 and 2.000 mdaN). Wire-lock the plug in accordance with 20-21-13.

(13) Depressurize the hydraulic reservoirs of the appropriate main (i.e., green or blue) and the standby (yellow) systems (Ref. Chap.29).

CAUTION: FAILURE TO USE THE RAMP SUPPORT BLOCKS WILL RESULT IN DAMAGE TO THE RAMPS AND/OR STRUCTURE.

(14) Position the front and rear ramp support blocks under the ramps.

C. Remove Actuator

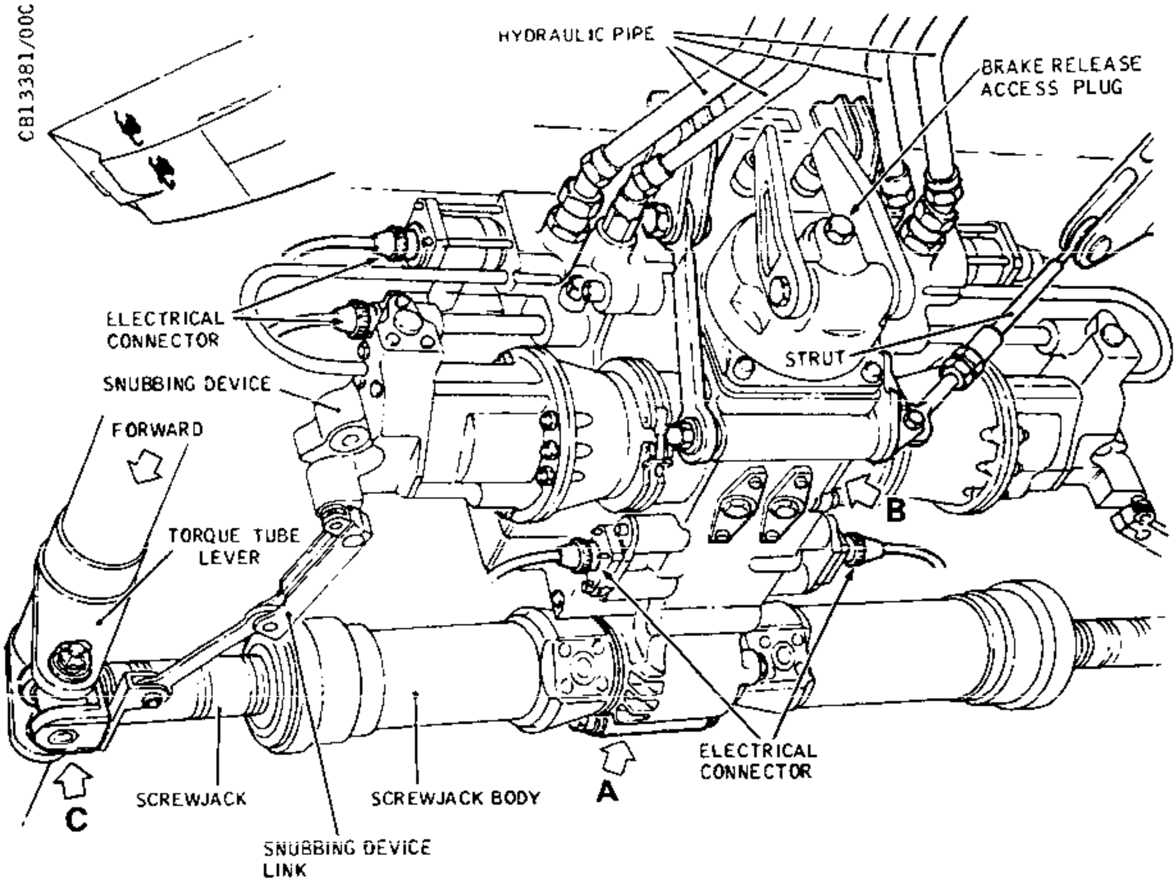
(1) Disconnect the electrical connectors from the actuator. Secure the connectors clear of the area being worked in.

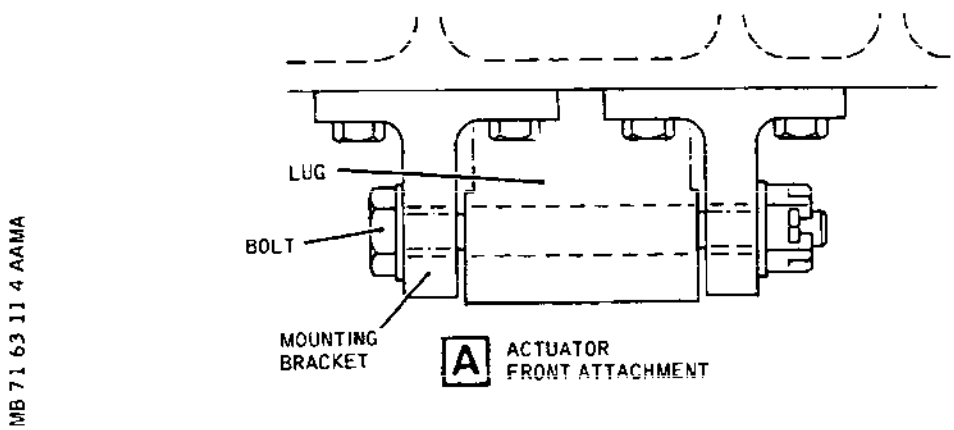
(2) Remove the bolts and the cable clip from the main and standby snubbing device.

(3) Disconnect the front ramp links from the torque tubes in accordance with 71-63-12, then lower and rest the front ramp on the support block.

(4) Remove the bolts and clamp securing the four hydraulic pipes.

(5) Position a container under the right-angled hydraulic pipe connections in the roof of the intake, and loosen the pipe union nuts.





R - Ramp Actuator - Installation (Sheet 1 of 2)
Figure 401

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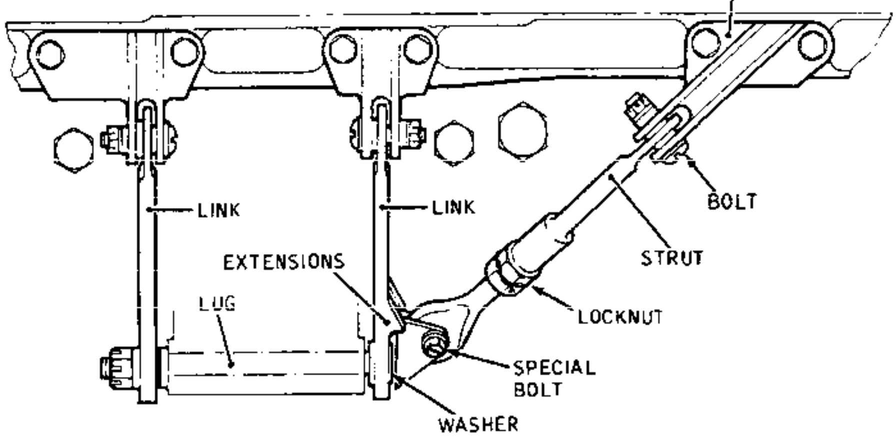
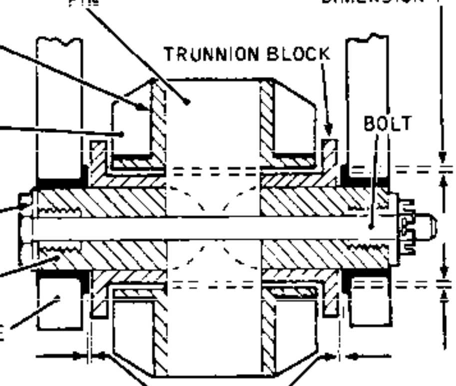


B ACTUATOR REAR ATTACHMENT



C TRUNNION ASSEMBLY

CMB 71 63 11 4 AAMB

R - Ramp Actuator - Installation (Sheet 2 of 2)
Figure 401

(6) Position a container under the hydraulic pipe connections at the actuator. Disconnect the hydraulic pipes from the actuator; immediately fit suitable blanks to the pipes and adapters.

(7) Move the pipes clear of the actuator and hand-tighten the right-angled connections in the intake roof.

(8) Remove the containers and remove any hydraulic fluid which may have been spilled.

(9) Protect the threads of the screwjacks with a suitable covering, e.g., thick polythene sheet.

(10) Disconnect each screwjack from the associated torque tube lever as follows (Detail C):-

(a) Support the rear ramp and screwjack.

(b) Remove the split pin, nut, washer, bolt and washer.

(c) Using the extractor, ease the bearing pins away from the fork-end pin, leaving the bearing pins retained by the torque tube levers and trunnion block.

(d) Push out and retain the fork-end pins.

(11) Carefully lower the rear ramp until the torque tube levers are clear of the screwjack fork ends. Rest the rear ramp on the support block.

(12) Remove the split pin, nut, washers, bolt and washer from each end of the strut fitted between the structure bracket and special bolt. Remove the strut.

(13) Remove the split pin, nut and washer from the special bolt at the actuator rear attachment (Detail B) and from the bolt at the front attachment (Detail A). Do not remove either bolt at this stage.

(14) Position the lifting equipment inside the intake.

CAUTION: AFTER OPERATION (15), EXERCISE CARE WHEN RAISING A DISCONNECTED REAR RAMP BECAUSE, WITH THE ACTUATOR REMOVED, THE UPWARD MOVEMENT OF THE RAMP IS UNRESTRAINED AND THE

TORQUE TUBE LEVER/LINK EYE-END ASSEMBLY MAY DAMAGE THE LOWER SKIN OF THE BLEED FLOOR/ INTAKE ROOF.

(15) Support the actuator; remove the special bolt from the actuator rear attachment and then the bolt from the front attachment. Lower the actuator on to the servicing extension.

(16) Remove the actuator from the intake and place it in a suitable stand.

(17) Retain each fork-end pin with its associated screwjack fork-end.

D. Prepare to Install Actuator

(1) Check that the actuator is set at the mid-stroke (approximately) position.

(2) With each trunnion block retained by its bearing pins between the torque tube levers, lubricate the fork-end pin bore in each trunnion block with Never-Seez grease. Ensure that grease is not left on any face of either trunnion block.

(3) Check that the total clearance at the ends of each trunnion block (Detail C, dimensions X) is between 0.001 and 0.008 in (0.0254 and 0.2032 mm).

E. Install Actuator

(1) Ensure that the safety precautions taken in operations B.(2) to (7) have not been cancelled.

(2) Position the actuator on the lifting equipment inside the intake.

(3) Assemble the actuator to the roof of the intake, as follows:-

(a) Use the lifting equipment and raise the actuator to position the rear attachment lug between the links, and the front attachment lug between the mounting brackets.

R (b) Insert the bolt through the mounting brackets and
R front attachment lug. Do not fit a washer or nut
R at this stage.

(c) With a countersunk washer under its head, insert the special bolt through the links and rear attachment lug, ensuring that the head is correctly placed. Fit a washer and nut to the bolt.

(d) Check that the torque required to rotate the front attachment bolt does not exceed 40 lbf in (0.452 mdaN).

(e) Torque-tighten the nut on the rear attachment bolt to between 215 and 240 lbf in (2.429 and 2.712 mdaN). Fit a split pin, previously coated with sealant (Ref. 20-22-19).

(f) Remove the lifting equipment from the intake.

(g) Position the strut between the structure bracket and special bolt. With a thin washer under its head, insert the bolt to secure the strut to the structure bracket. Fit the special thick washer, thin washer and a nut; hand-tighten the nut.

(h) With a thin washer under its head, insert the bolt through the strut and special bolt, ensuring that the bolt can be inserted without excessive load. If the bolt can be inserted without excessive load, fit the special thick washer, thin washer and a nut; hand-tighten the nut.

NOTE: If the bolt cannot be inserted without excessive load, adjust the length of the strut as detailed in operation (i).

(i) Adjust the strut, if necessary, as follows:-

i1) Determine whether the strut requires to be lengthened or shortened.

i2) Remove the nuts, washers, bolts and washers securing the strut; remove the strut.

i3) Loosen the strut locknut; lengthen or shorten the strut as required, finally aligning the witness marks on each part of the strut.

NOTE: The strut can be adjusted only in half-turns, so an exact length may

be impossible to obtain.

i4) Torque-tighten the strut locknut to between 160 and 180 lbf in (1.808 and 2.034 mdaN). Do not wire-lock the locknut at this stage.

(j) Install the strut (Ref. paras.(g) and (h)).

(k) Torque-tighten the nuts on the bolts securing the strut to between 25 and 30 lbf in (0.282 and 0.339 mdaN); align the split pin holes, but do not fit split pins at this stage.

(4) Remove the fork-end pin from each screwjack fork-end. Carefully raise the rear ramp until the trunnion blocks slide into and align with the screwjack fork-ends.

(5) Assemble each screwjack to the torque tube lever as follows:-

(a) With the holes in the screwjack fork-end aligned with the hole in the trunnion block, insert the fork-end pin through the fork-end and trunnion block.

(b) Using a soft-metal tapered drift, align the hole in the fork-end pin with the holes in the bearing pins.

(c) Place a washer under the bolt head; with the head of the bolt facing forward, carefully insert the bolt through the bearing pin, fork-end pin and bearing pin.

(d) Fit a washer and nut to the bolt and torque-tighten the nut to between 50 and 60 lbf in (0.565 and 0.678 mdaN).

(e) Check that the total clearance between the flanges of the screwjack fork-end shoulder bearings and the trunnion block (Detail C, dimensions Y) is between 0.001 and 0.005 in (0.0254 and 0.127 mm).

CAUTION: DO NOT BOND THE WASHER TO THE NUT WITH SEALANT.

DO NOT ALLOW SEALANT TO CONTAMINATE THE TRUNNION ASSEMBLY.

(f) Lock the nut with a split pin. Encapsulate the nut, split pin and bolt end only with sealant in accordance with 20-22-19, Method 1.

(6) Remove the protective cover from the screwjacks.

(7) Remove the blanks from the hydraulic pipes and adapters. Wipe the threads and mating surfaces with clean Kimwipe tissues, or clean lint-free cloth. Lightly lubricate the threads with clean hydraulic fluid.

(8) Connect the hydraulic pipes to the actuator, tightening the union nuts finger-tight.

(9) Position the pipe clamp and fit the bolts. Torque-tighten the bolts to between 25 and 30 lbf in
R (0.282 and 0.339 mdaN). Wire-lock the bolts in accordance with 20-21-13.

(10) Torque-tighten the pipe union nuts at each end of the pipes in accordance with 20-23-11 and 20-23-12 and to the following values:-

(a) The smaller diameter union nuts: to between 160 and 180 lbf in (1.808 and 2.034 mdaN).

(b) The larger diameter union nuts: to between 300 and 420 lbf in (3.390 and 4.746 mdaN).

(11) Check that overtravel exists in the snubbing mechanism with the screwjack threads fully extended and then fully retracted, as follows:-

(a) Remove the brake release access plug from the brake unit (Ref. Fig. 401).

(b) Using the brake release tool as detailed on the attached label, disengage the brake.

(c) Rotate the screwjack bodies until the screwjack threads are fully extended.

(d) Remove the split pin, nut and washer from the bolt securing each snubbing device link to the screwjack fork-ends (Ref. Fig. 402).

(e) Remove each bolt and washer, in turn. Maintaining the holes in the fork-end and link in lateral alignment, pull the link toward the fork-end; check that the holes in the fork-end

and the hole in the link are misaligned by not less than 0.020 in (0.508 mm).

(f) Align the holes and, with washers under their heads, insert the bolts to retain the snubbing device links in the fork-ends.

(g) Rotate the screwjack bodies until the screwjack threads are fully retracted.

(h) Remove each bolt and washer, in turn, from the snubbing device link and fork-end. Maintaining the holes in the fork-end and link in lateral alignment, pull the link away from the fork-end; check that the holes in the fork-end and the hole in the link are misaligned by not less than 0.020 in (0.508 mm).

(i) Align the holes and, with washers under their heads, insert the bolts to retain the snubbing device links in the screwjack fork-ends.

(j) If the requirement of either operation (e) or operation (h) is not met, carry out operation (12). If the requirements are met, disregard operation (12) and proceed with operation (13).

(12) Adjust the overtravel of the snubbing device, by altering the position of the actuator laterally, as follows:-

(a) Set the screwjacks to the position (i.e., fully extended or fully retracted) where the overtravel is insufficient.

(b) Remove the nuts, washers, bolts and washers securing the strut (Ref. Fig. 401); remove the strut.

(c) Loosen the strut locknut; lengthen or shorten the strut by one half-turn. Align the witness marks and tighten the locknut.

(d) Position the strut between the structure bracket and special bolt; insert the bolt and washer to secure the strut to the structure bracket.

(e) Moving the actuator laterally, as required, to align the holes, insert the bolt and washer to secure the strut to the special bolt.

(f) Repeat operations (11)(e) to (j) to recheck the overtravel.

(g) If the overtravel is still not correct, repeat operations (b) and (c), taking into account that the strut must not be altered by more than two full turns, in either direction, until the overtravel is satisfactory.

(h) Repeat operations (d) to (g).

(13) When the overtravel is satisfactory:-

(a) Fit the special thick washer, thin washer and a nut to each bolt securing the strut. Torque= tighten the nuts to between 25 and 30 lbf n (0.282 and 0.339 mdaN). Fit split pins, previously coated with sealant (Ref. 20-22-19).

(b) Check that the strut is in safety. Torque-tighten the locknut on the strut to between 160 and 180 lbf in (1.808 and 2.034 mdaN). Wire-lock the locknut in accordance with 20-21-13.

(c) Fit a washer and nut to each bolt securing the snubbing device link to the screwjack fork-ends. Torque-tighten each nut to between 36 and 44 lbf in (0.407 and 0.497 mdaN). Fit split pins, previously coated with sealant (Ref. 20-22-19).

(d) Rotate the screwjack bodies and set the screw-jacks to approximately the mid-stroke position.

<u>NOTE</u>: If operation (16) is known to be unnecessary, carry out operations (e) and (f).

(e) Using the brake release tool (following the instructions on the label in reverse order), engage the brake; remove the release tool.

(f) Fit the plug to the brake unit. Torque-tighten the plug to between 133 and 177 lbf in (1.503 and 2.000 mdaN). Wire-lock the plug in accordance with 20-21-13.

(14) Check that the torque required to rotate the actuator front attachment bolt does not exceed 50 lbf in (0.565 mdaN).

(15) Fit a washer and nut to the front attachment bolt.

Torque-tighten the nut to between 160 and 180 lbf in (1.808 and 2.034 mdaN). Fit a split pin, previously coated with sealant (Ref. 20-22-19).

(16) If the setting of the resolvers is not known, check the resolver signals as follows:-

(a) Using the brake release tool as detailed on the attached label, disengage the brake; rotate the screwjack bodies until the ramp actuator gauge is a sliding fit between each screwjack body and the face of the associated fork-end. When the screwjacks are in the exact mid-stroke position, engage the brake and fit the plug as detailed in operations (13)(e) and (f).

(b) Connect the resolver test set as follows:-

b1) Ensure that the ON - OFF switch on the test set is at the OFF position.

b2) Connect the appropriate end of the power loom to the connector PL1 on the test set and connect the other end to a 115 V 400 Hz electrical supply.

b3) Connect the single end of the ramp resolver loom to the connector PL2 on the test set and connect the appropriate tails, identified by the attached labels, to the resolvers.

b4) On the test set, set the RESOLVER SELECT switch to "MAIN CONTROL".

b5) Set the ON - OFF switch to "ON"; check that the angle position indicator is illuminated.

(c) With the RESOLVER SELECT switch at MAIN CONTROL, check that the angle position indicator (API) displays 0 deg (360 deg) (±8 min).

(d) Set the RESOLVER SELECT switch to "MAIN MONITOR"; check that the API displays 0 deg (360 deg) (±8 min).

(e) Set the RESOLVER SELECT switch to "ALT CONTROL"; check that the API displays 90 deg (±8 min).

(f) Set the RESOLVER SELECT switch to "ALT MONITOR"; check that the API displays 90 deg (±8 min).

(g) Switch off the resolver test set and disconnect it from the unit.

(17) Connect the electrical connectors to the actuator, ensuring that the mating surfaces are clean and undamaged.

(18) Secure the looms for the resolvers to the facility provided on the forward face of the snubbing device that is mounted on each hydraulic motor, as follows:-

(a) Fit the cable clip over the loom and secure it to the actuator with the two bolts.

(b) Torque-tighten the bolts to between 12 and 15 lbf in (0.136 and 0.169 mdaN).

(c) Wire-lock the bolts in accordance with 20-21-13.

(d) Encapsulate the bolt heads with sealant in accordance with 20-22-19, Method 1.

(19) Check the oil level in the actuator gear case, and if necessary replenish, in accordance with 12-13-71.

(20) Lubricate the screwjack threads with grease in accordance with 12-22-71.

(21) Connect the front ramp links to the torque tubes in accordance with 71-63-12.

(22) Pressurize the hydraulic reservoirs (Ref. Chap.29).

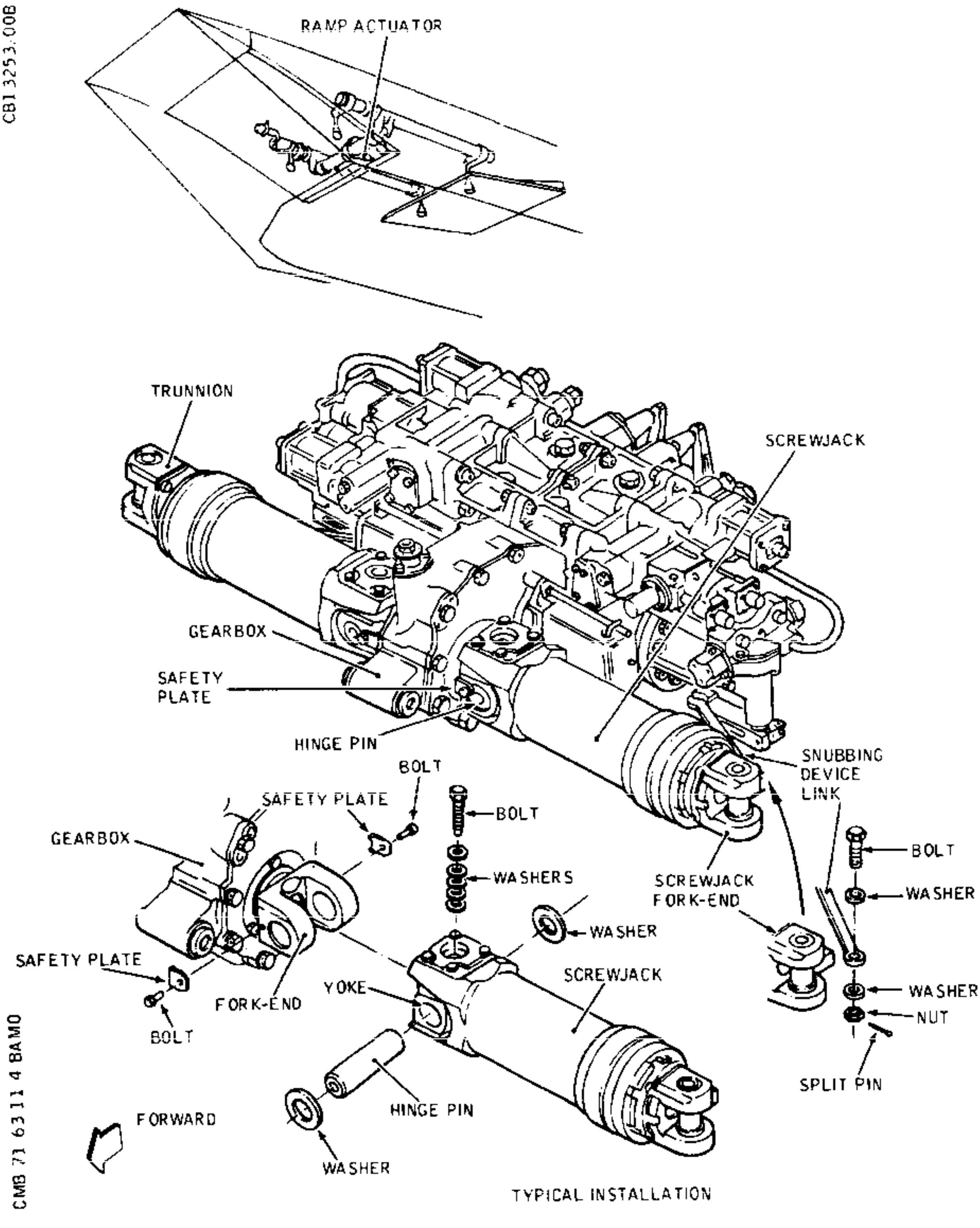
F. Conclusion

(1) Carry out a Functional Test as detailed in Adjustment/Test.

(2) Carry out the appropriate Preliminary Test as detailed in 71-61-00, Adjustment Test, '3. Operational Test (Excluding Ramp Manual Inching, Spill Door Manual Inching and Auxiliary Inlets)'.

3. Screwjack (Ref. Fig. 402)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.



Screwjack - Installation
Figure 402

A. Equipment and Materials

DESCRIPTION	PART NO.
Protective cover, for screwjack threads (e.g., thick polythene sheet)	-
Support block (front ramp)	D925453000
Support block (rear ramp)	D925453001
Ramp actuator gauge, (mid-stroke setting)	E925053000
Brake release tool	E925089000
Torque spanner, 36 to 44 lbf in (0.407 to 0.497 mdaN)	-
Torque spanner, 50 to 60 lbf in (0.565 to 0.678 mdaN)	-
Torque spanner, 133 to 177 lbf in (1.503 to 2.000 mdaN)	-

B. Prepare to Remove Screwjack

(1) Carry out the procedures detailed in paragraphs 2.B.(2) to (11).

(2) Remove the brake release access plug from the brake unit (Ref. Fig. 401).

(3) Using the brake release tool as detailed on the attached label, disengage the brake.

(4) Rotate the screwjack bodies and set the screwjacks to approximately the mid-stroke position.

C. Remove Screwjack

(1) Disconnect the front ramp links from the torque tubes in accordance with 71-63-12, then lower and rest the front ramp on the support block.

(2) Disconnect each screwjack from the associated torque

tube lever as follows (Ref. Fig. 401).

(a) Support the rear ramp and screwjack.

(b) Remove the split pin, nut, washer, bolt and washer.

(c) Using the extractor, ease the bearing pins away from the fork-end pin, leaving the bearing pins retained by the torque tube levers and trunnion block.

(d) Push out the fork-end pins. Retain each pin with its associated screwjack fork-end.

(3) Carefully lower the rear ramp until the torque tube levers are clear of the screwjack fork-ends. Rest the rear ramp on the support block.

(4) Disconnect the snubbing device link from the appropriate screwjack, as follows:-

(a) Remove the split pin, nut, washers and bolt securing the link to the fork on the screwjack fork-end.

(b) Ease the link from the fork and temporarily secure the link clear of the screwjack.

NOTE: In operations (5), (6) and (7), it is permissible to rotate the screwjack bodies to improve accessibility.

(5) Remove the hinge pin securing bolt, located in one bore of the yoke, sufficiently to clear the indent in the hinge pin.

(6) Remove the two bolts and safety plates retaining the hinge pin in the yoke.

(7) Support the screwjack and remove the hinge pin and two washers.

CAUTION: AFTER OPERATION (8), EXERCISE CARE WHEN RAISING A DISCONNECTED REAR RAMP BECAUSE, WITH THE SCREWJACKS REMOVED, THE UPWARD MOVEMENT OF THE RAMP IS UNRESTRAINED AND THE TORQUE TUBE LEVER/LINK EYE-END ASSEMBLY MAY DAMAGE THE LOWER SKIN OF THE BLEED FLOOR/ INTAKE ROOF.

(8) Disengage and remove the screwjack.

(9) Place a protective cover on the screwjack threads.

(10) Retain the fork-end pin with the removed screwjack.

D. Prepare to Install Screwjack

<u>CAUTION:</u> BOTH SCREWJACKS MUST BE SET TO EXACTLY THE SAME DIMENSION BETWEEN THE SCREWJACK BODY AND THE FACE OF THE ASSOCIATED FORK-END, OTHERWISE DAMAGE WILL RESULT WHEN THE ACTUATOR IS OPERATED.

(1) Check endfloat of screwjack hinge pin. The endfloat of the screw jack hinge pin within the gearbox fork end should be checked using a D.T.I. An approximate measurement may also be made with feeler gauges between the end of the hinge pin and the safety plates but is less satisfactory due to wear of the safety plate. End float greater than 0.010 in. or evidence of the pin contacting the safety plate necessitates replacements of the shim washers (Ref. I.P.C. 71-63-11 Fig. 1.). (MCR ETA AH6 0005 - Churley 18.4.79).

(2) Measure, accurately, the dimension between the screwjack body and the fork-end of the screwjack still fitted to the actuator.

(3) Set the screwjack to be installed to the dimension determined in operation (1).

(4) With each trunnion block retained by its bearing pins between the torque tube levers, lubricate the fork-end pin bore in each trunnion block with Never-Seez grease. Ensure that grease is not left on any face of either trunnion block.

(5) Check that the total clearance at the ends of each trunnion block (Ref. Fig. 401) (Detail C, dimension X) is between 0.001 and 0.008 in (0.0254 and (0.2032 mm).

E. Install Screwjack

(1) Ensure that the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.

<u>CAUTION:</u> ENSURE THAT THE REQUIREMENTS OF PARAGRAPH D. HAVE BEEN MET.

(2) Position the yoke of the screwjack in the fork-end on the gearbox.

(3) Align the holes and insert the hinge pin, ensuring that the indent in the hinge pin is aligned with the appropriate hole in the yoke.

(4) Screw in the bolt, ensuring that it engages the indent in the hinge pin.

(5) Torque-tighten the bolt to between 36 and 44 lbf in
R (0.407 and 0.497 mdaN). Wire-lock the bolt in
R accordance with 20-21-13.

(6) Place one washer on one end of the hinge pin; position the safety plate and fit the bolt.

(7) Place the other washer on the other end of the hinge pin; position the safety plate and fit the bolt.

(8) Torque-tighten each bolt to between 36 and 44 lbf in (0.407 and 0.497 mdaN). Wire-lock the bolts in accordance with 20-21-13.

(9) Rotate the screwjack bodies until the ramp actuator gauge is a sliding fit between the screwjack body and the face of the associated fork-end of the screwjack not removed.

(10) With the fork on the screwjack fork-end (which houses one end of the snubbing device link) correctly positioned, check that the actuator gauge is a sliding fit between the screwjack body and the face of the associated fork-end of the renewed screwjack.

(11) Position the snubbing device link in the fork on the screwjack fork-end; insert the bolt and washer from the top, and fit a washer and nut.

(12) Torque-tighten the nut to between 36 and 44 lbf in (0.407 and 0.497 mdaN); fit a split pin, previously coated with sealant (Ref. 20-22-19).

(13) Remove the fork-end pin from each screwjack fork-end. Carefully raise the rear ramp until the trunnion blocks slide into and align with the screwjack fork-ends.

(14) Assemble each screwjack to the torque tube lever, as follows (Ref. Fig. 401):-

(a) With the holes in the screwjack fork-end

aligned with the hole in the trunnion block, insert the fork-end pin through the fork-end and trunnion block.

(b) Using a soft-metal tapered drift, align the hole in the fork-end pin with the holes in the bearing pins.

(c) Place a washer under the bolt head; with the head of the bolt facing forward, carefully insert the bolt through the bearing pin, fork-end pin and bearing pin.

(d) Fit a washer and nut to the bolt and torque-tighten the nut to between 50 and 60 lbf in (0.565 and 0.678 mdaN).

(e) Check that the total clearance between the flanges of the screwjack fork-end shoulder bearing and the trunnion block (Detail C, dimension Y) is between 0.001 and 0.005 in (0.0254 and 0.127 mm).

CAUTION: DO NOT BOND THE WASHER TO THE NUT WITH SEALANT.

DO NOT ALLOW SEALANT TO CONTAMINATE THE TRUNNION ASSEMBLY.

(f) Lock the nut with a split pin. Encapsulate sealant in accordance with 20-22-19, Method 1.

(15) Remove the protective cover from the screwjacks.

(16) Connect the front ramp links to the torque tubes in accordance with 71-63-12.

(17) Using the brake release tool (following the instructions on the attached label in reverse order) engage the actuator brake. Remove the release tool.

(18) Refit the plug to the brake unit. Torque-tighten the plug to between 133 and 177 lbf in (1.503 and 2.000 mdaN). Wire-lock the plug in accordance with 20-21-13.

(19) Lubricate the screwjack threads with grease in accordance with 12-22-71.

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F. Conclusion

(1) Carry out a Functional Test as detailed in Adjustment/Test.

4. Hydraulic Motor (Ref. Fig. 403)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

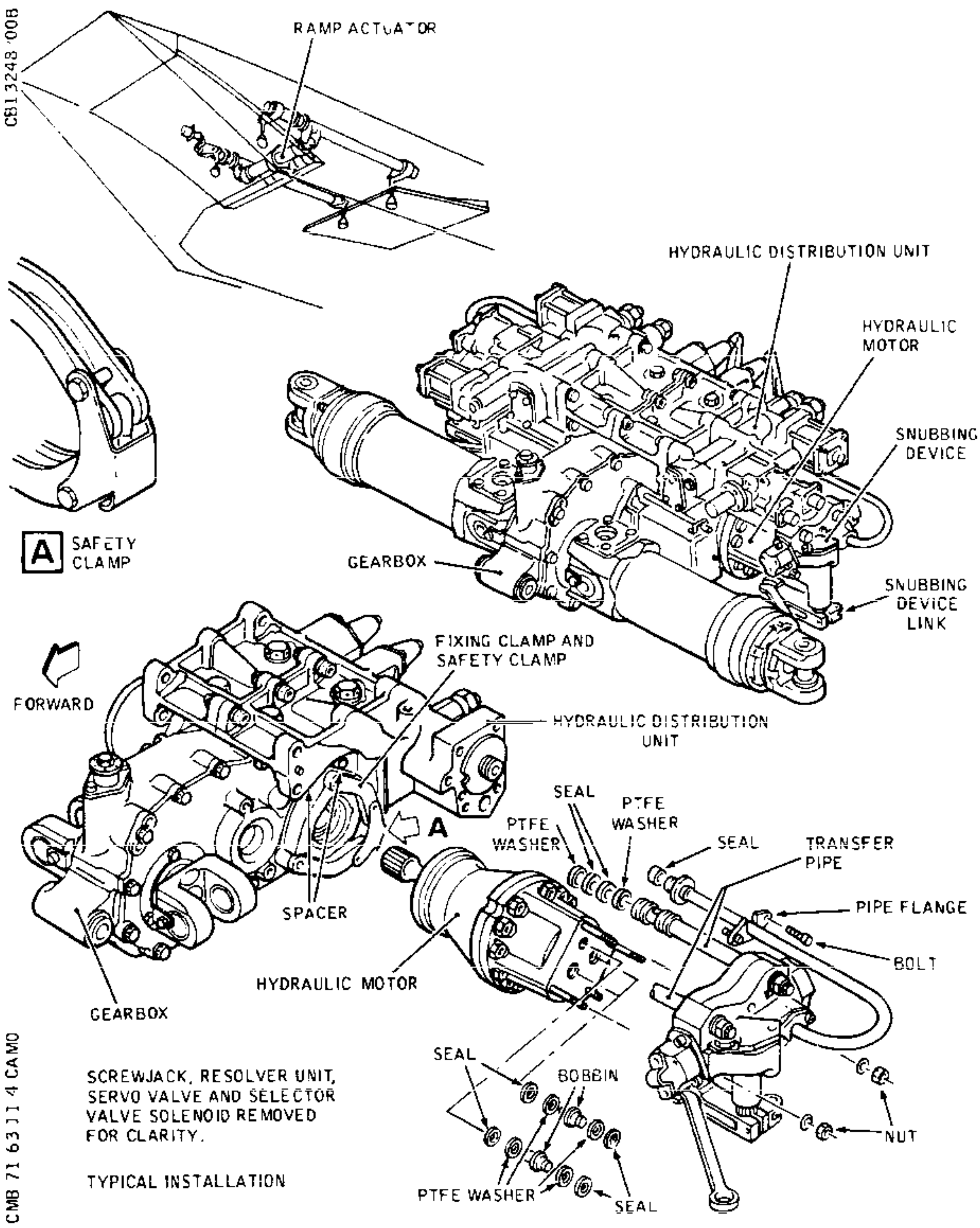
CAUTION: EXTREME CARE MUST BE TAKEN TO ENSURE THAT FOREIGN MATTER IS NOT INTRODUCED INTO THE ACTUATOR.

A. Equipment and Materials

DESCRIPTION	PART NO.
Container, for collecting hydraulic fluid	-
Brake release tool	E925089000
Torque spanner, 12 to 15 lbf in (0.136 to 0.169 mdaN)	-
Torque spanner, 18 to 27 lbf in (0.203 to 0.305 mdaN)	-
Torque spanner, 36 to 44 lbf in R (0.407 to 0.497 mdaN)	-
Torque spanner, 80 to 98 lbf in (0.904 to 1.107 mdaN)	-
Torque spanner, 53 to 71 lbf in (0.599 to 0.802 mdaN)	-
Torque spanner, 133 to 177 lbf in (1.503 to 2.000 mdaN)	-
Clean lint-free cloth	-
R Corrosion resistant steel wire R 0.031 in (0.8mm)	DTD189

B. Prepare to Remove Hydraulic Motor

(1) Carry out the procedures detailed in paragraphs 2.B.



Hydraulic Motor - Installation
Figure 403

(2) to (11) and (13).

(2) Remove the brake release access plug from the brake unit (Ref. Fig. 401).

(3) Using the brake release tool as detailed on the attached label, disengage the brake; rotate the screwjack bodies to fully lower the ramps. Engage the brake, following the instructions on the label in reverse order. Remove the release tool.

(4) Refit the plug to the brake unit. Torque-tighten the plug to between 133 and 177 lbf in (1.503 and 2.000 mdaN). Wire-lock the plug in accordance with 20-21-13.

(5) Position the container to collect residual hydraulic fluid.

C. Remove Hydraulic Motor

(1) Remove the split pin, nut, washer, bolt and washer securing the snubbing device link to the screwjack fork-end (Ref. Fig. 402).

(2) Remove the two bolts securing the pipe flange to the hydraulic distribution unit.

(3) Remove the two bolts and cable clip securing the loom to the snubbing device.

(4) Remove the four nuts and washers securing the snubbing device to the hydraulic motor.

(5) Carefully ease the snubbing device away from the hydraulic motor, ensuring that the linkage is not twisted, bent or otherwise damaged, and at the same time withdraw the two transfer pipes and the pipe from the hydraulic distribution unit. Discard the seals on the pipe and transfer pipes.

(6) Secure the snubbing device clear of the hydraulic motor; retain the bobbins and washers fitted between the snubbing device and the motor. Discard the seals.

(7) Remove the nut and bolt from the safety clamp; pivot the safety clamp to gain access to the nut on the fixing clamp.

(8) Record the position of the nut on the fixing clamp;

this will facilitate subsequent installation.

(9) Support the motor; remove the split pin and loosen the nut of the fixing clamp sufficiently to allow removal of the motor.

(10) Carefully disengage and remove the hydraulic motor from the gearbox.

D. Install Hydraulic Motor

(1) Ensure that the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.

(2) Ensure that the fixing clamp is correctly positioned, as recorded on removal.

(3) Position the hydraulic motor flanges inside the fixing clamp, ensuring that the splines are correctly engaged and the dowel, fitted to the motor flange, is engaged in the hole in the gearbox.

(4) Tighten the fixing clamp nut sufficiently to secure the motor.

(5) Torque-tighten the nut of the fixing clamp to between 53 and 71 lbf in (0.599 and 0.802 mdaN). Fit a split pin, previously coated with sealant (Ref. 20-22-19).

(6) Position the safety clamp and fit the bolt and nut. Hold the safety clamp as close as possible to the fixing clamp and torque-tighten the nut to between 18 and 27 lbf in (0.203 and 0.305 mdaN). Wire-lock the nut to the bolt head in accordance with 20-21-13.

(7) Fit the bobbins and washers, complete with new seals, into the hydraulic motor.

(8) Fit new seals to the hydraulic pipe and to the transfer pipes.

(9) Carefully position the snubbing device on the studs in the motor; move the device toward the motor, at the same time easing the two transfer pipes and the pipe into the hydraulic distribution unit.

(9) Fit the four nuts and washers to secure the snubbing device to the motor.

(11) Torque-tighten the nuts, progressively and in

a diametrical sequence, to between 80 and 98 lbf in (0.904 and 1.107 mdaN).

(12) Position the pipe flange and fit the bolts.

(13) Torque-tighten the bolts to between 36 and 44 lbf in (0.407 and 0.497 mdaN).

(14) Position the snubbing device link in the screw-jack fork-end. With a washer under its head, insert the bolt and fit a washer and nut (Ref. Fig. 402).

(15) Torque-tighten the nut to between 36 and 44 lbf in (0.407 and 0.497 mdaN). Fit a split pin, previously coated with sealant (Ref. 20-22-19).

(16) Position the loom and cable clip on the snubbing device and fit the bolts. Torque-tighten the bolts to between 12 and 15 lbf in (0.136 and 0.169 mdaN).

(17) Lock the following items with locking wire in accordance with 20-21-13:-

(a) The two bolts securing the cable clip.

(b) The four nuts securing the snubbing device.

(c) The two bolts securing the pipe flange.

E. Conclusion

(1) Remove the container and remove any hydraulic fluid which may have been spilled.

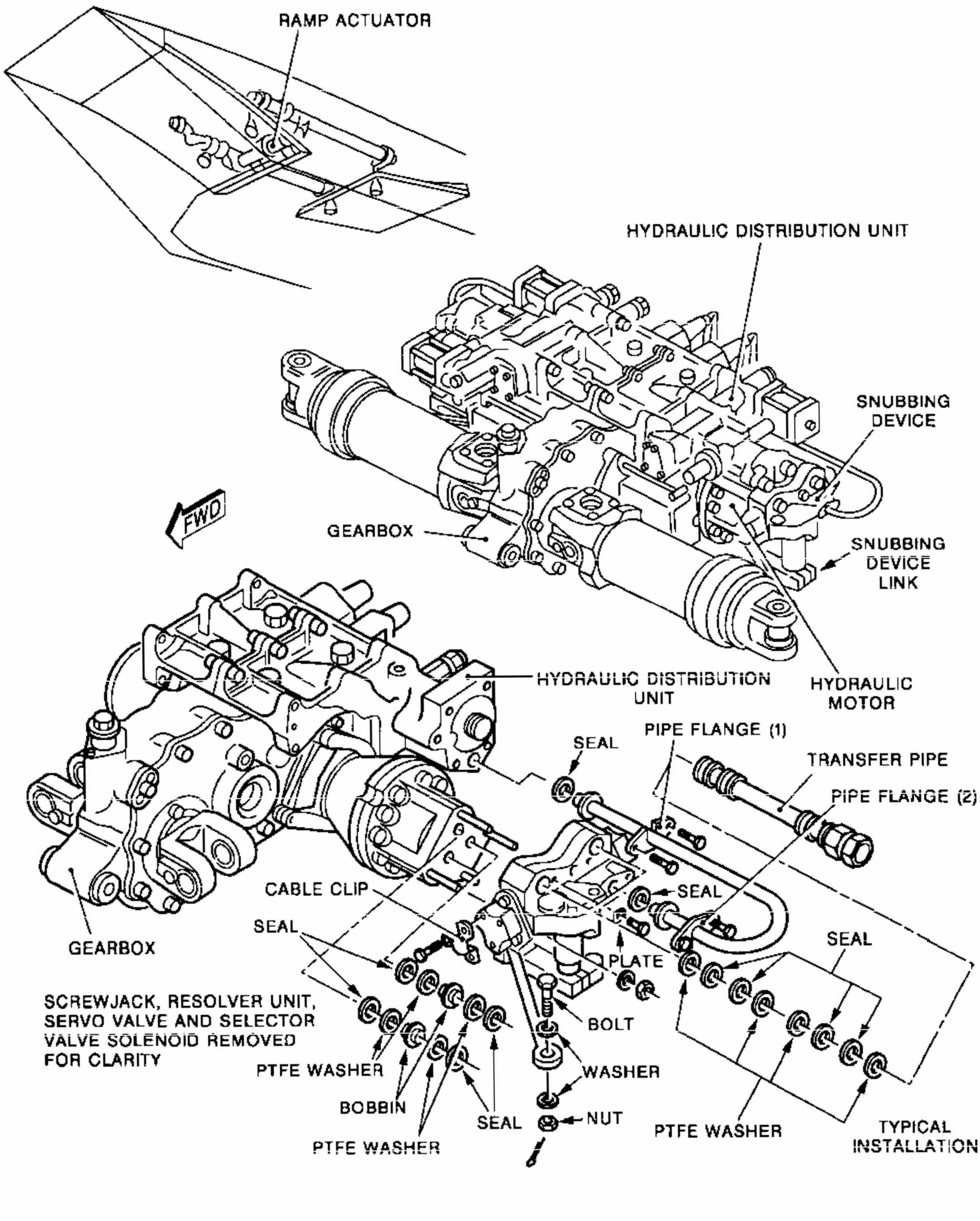
(2) Carry out a Functional Test as detailed in Adjustment/Test.

5. <u>Snubbing Device</u> (Ref. Fig. 404)

<u>WARNING</u>: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

<u>CAUTION</u>: EXTREME CARE MUST BE TAKEN TO ENSURE THAT FOREIGN MATTER IS NOT INTRODUCED INTO THE ACTUATOR.

A. Equipment and Materials



Snubbing Device - Installation
Figure 404

PRINTED IN ENGLAND

DESCRIPTION	PART NO.
Container, for collecting hydraulic fluid	-
Brake release tool	E925089000
Torque spanner, 12 to 15 lbf in (0.136 to 0.169 mdaN)	-
Torque spanner, 36 to 44 lbf in (0.407 to 0.497 mdaN)	-
Torque spanner, 80 to 98 lbf in (0.904 to 1.107 mdaN)	-
Torque spanner, 133 to 177 lbf in (1.503 to 2.000 mdaN)	-
Clean lint-free cloth	-
R R Corrosion resistant steel wire 0.031 in (0.8mm)	DTD189

B. Prepare to Remove Snubbing Device

(1) Carry out the procedures detailed in paragraphs 2.B.(2) to (11) and (13).

(2) Remove the brake release access plug (Ref. Fig. 401).

(3) Using the brake release tool as detailed on the attached label, disengage the brake; rotate the screwjack bodies to fully lower the ramps. Engage the brake, following the instructions on the label in reverse order. Remove the release tool.

(4) Refit the plug to the brake unit. Torque-tighten the plug to between 133 and 177 lbf in (1.503 and 2.000 mdaN). Wire-lock the plug in accordance with 20-21-13.

(5) Position the container to collect residual hydraulic fluid.

C. Remove Snubbing Device

(1) Remove the split pin, nut, washer, bolt and washer securing the snubbing device link to the screwjack fork-end.

(2) Remove the two bolts securing the pipe flange (1) to the hydraulic distribution unit.

(3) Remove the two bolts and cable clip securing the loom to the snubbing device.

(4) Remove the four nuts and washers securing the snubbing device to the hydraulic motor.

(5) Carefully ease the snubbing device away from the hydraulic motor, and at the same time withdraw the two transfer pipes and the pipe from the distribution unit.

(6) Retain the bobbins fitted between the motor and snubbing device. Discard the seals.

(7) Remove the pipe from the snubbing device, as follows:-

(a) Remove the two bolts securing the pipe flange (2). Remove the pipe.

(b) Remove and discard the seals from the pipe.

(8) Remove each transfer pipe from the snubbing device, as follows:-

(a) Remove the bolt and plate retaining the transfer pipe.

(b) Withdraw the transfer pipe from the device.

(c) Remove and discard all seals from the transfer pipe.

D. Prepare to Install Snubbing Device

(1) Fit new seals to the plug end of the transfer pipes, to the pipe and to the bobbins.

(2) Lightly lubricate with clean hydraulic fluid:-

(a) The seals on the transfer pipes.

(b) The seals on the pipe.

(c) The seals on the bobbins.

(3) Fit the transfer pipes to the snubbing device, as follows:-

(a) Ensuring that the plug end of each transfer pipe is positioned for correct engagement with their plates, insert the transfer pipes into the device.

(b) Position the plates and fit the bolts; torque-tighten the bolts to between 36 and 44 lbf in (0.407 and 0.497 mdaN).

(c) Interlock the bolts securing the plates with locking wire in accordance with 20-21-13.

(4) Fit new seals to the distribution unit end of the transfer pipes. Lightly lubricate the seals with clean hydraulic fluid.

E. Install Snubbing Device

(1) Fit the bobbins into the hydraulic motor.

(2) Carefully position the device on the studs in the motor; move the device toward the motor, at the same time easing the transfer pipes into the distribution unit.

(3) Fit the four washers and nuts to secure the device to the motor; torque-tighten the nuts to between 80 and 98 lbf in (0.904 and 1.107 mdaN).

(4) Position the pipe and ease it, simultaneously, into the device and the distribution unit.

(5) Position, in turn, the pipe flanges (1) and (2) and fit the bolts. Torque-tighten the bolts to between 36 and 44 lbf in (0.407 and 0.497 mdaN).

(6) Check that overtravel exists in the snubbing mechanism as detailed in paragraph 2.E.

(7) When overtravel is satisfactory, position the device link in the screwjack fork-end. With a washer under its head, insert the bolt and fit a washer and nut. Torque-tighten the nut to between 36 and 44 lbf in (0.407 and 0.497 mdaN). Fit a split pin, previously coated with sealant (Ref. 20-22-19).

(8) Position the loom and cable clip on the device and fit the bolts; Torque-tighten the bolts to between

12 and 15 lbf in (0.136 and 0.169 mdaN).

(9) Lock the following items with locking wire in accordance with 20-21-13:-

(a) The two bolts securing the cable clip.

(b) The two bolts securing the pipe flange (1).

(c) The two bolts securing the pipe flange (2).

(d) The four nuts securing the snubbing device.

F. Conclusion

(1) Remove the container and any hydraulic fluid which may have been spilled.

(2) Carry out a Functional Test as detailed in Adjustment/ Test.

6. Solenoid and Distributor (Ref. Fig. 405)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

CAUTION: EXTREME CARE MUST BE TAKEN TO ENSURE THAT FOREIGN MATTER IS NOT INTRODUCED INTO THE ACTUATOR.

A. Equipment and Materials

DESCRIPTION	PART NO.
Container, for collecting hydraulic fluid	-
Brake release tool	E925089000
Torque spanner, 36 to 44 lbf in (0.407 to 0.497 mdaN)	-
Torque spanner, 25 to 30 lbf in (0.282 to 0.339 mdaN)	-
Torque spanner, 133 to 177 lbf in (1.503 to 2.000 mdaN)	-
Torque spanner, 160 to 180 lbf in (1.808 to 2.034 mdaN)	-

DESCRIPTION	PART NO.
Torque spanner, 215 to 240 lbf in (2.429 to 2.712 mdaN)	-
Torque spanner, 300 to 420 lbf in (3.390 to 4.746 mdaN)	-
Clean lint-free cloth	-
R R Corrosion resistant steel wire 0.031 in (0.8mm)	DTD189

B. Prepare to Remove Solenoid and Distributor

NOTE: To gain access to remove the brake test selector valve solenoid and/or distributor with the actuator in situ, it is necessary to remove or disconnect certain items and swing the actuator downward about the forward attachment bolt. The two other solenoids/distributors can be removed without disturbing the actuator, therefore paragraph (5) applies to the brake test solenoid/distributor only; all other paragraphs apply to the three solenoids/ distributors.

(1) Carry out the procedures detailed in paragraphs 2.B.(2) to (11) and (13).

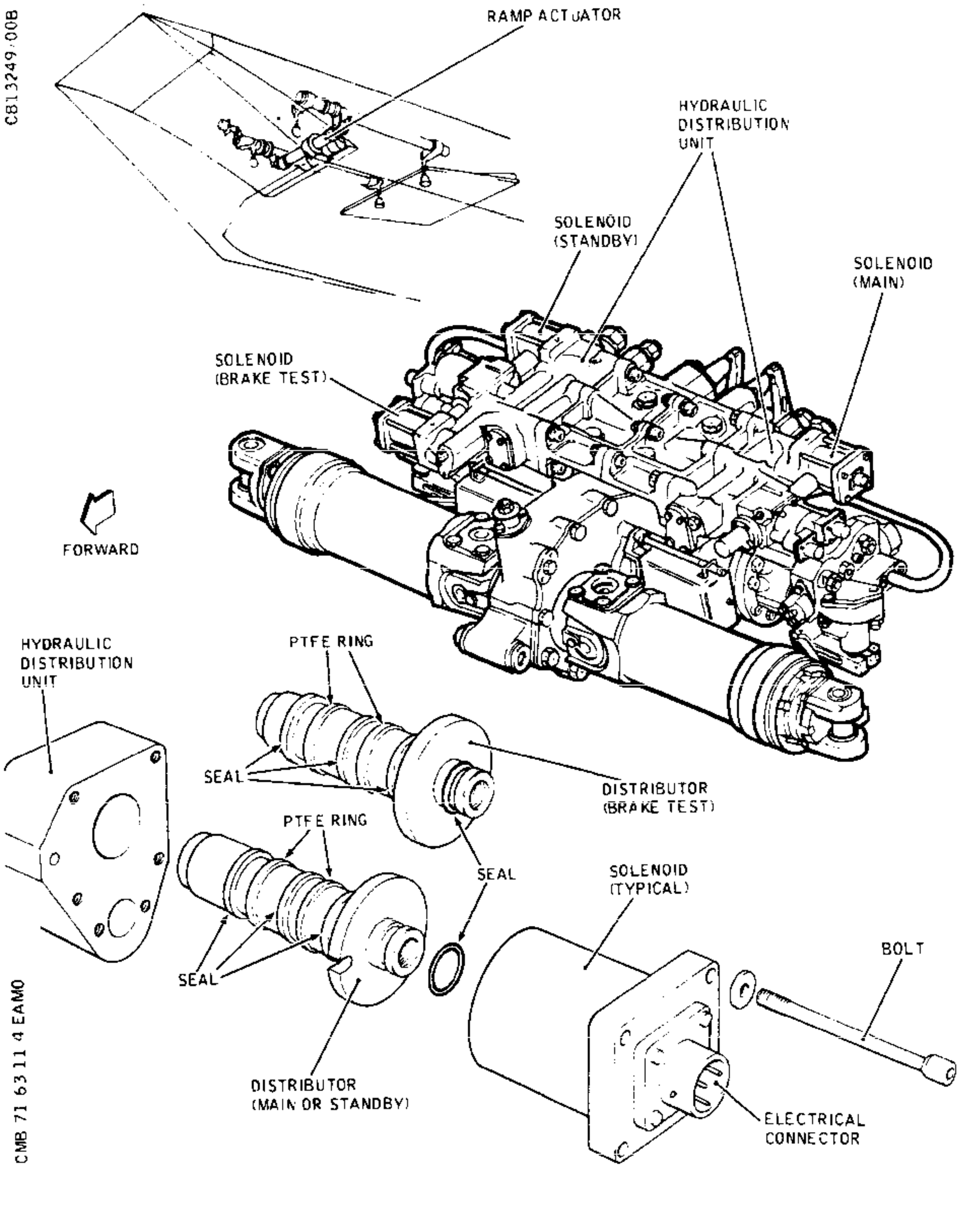
(2) Remove the brake release access plug from the brake unit (Ref. Fig. 401).

(3) Using the brake release tool as detailed on the attached label, disengage the brake; rotate the screwjack bodies to almost fully lower the ramps; engage the brake, following the instructions on the label in reverse order, and remove the release tool.

(4) Refit the plug to the brake unit. Torque-tighten the plug to between 133 and 177 lbf in (1.503 and 2.000 mdaN). Wire-lock the plug in accordance with 20-21-13.

(5) Gain access to the brake test solenoid and/or distributor, as follows:-

(a) Remove the split pin, nut, washer, bolt and



– Solenoid and Distributor – Installation
Figure 405

washer securing each snubbing device link to the screwjack fork-ends (Ref. Fig. 402).

(b) Remove the split pin, nut, thin washer, thick washer, bolt and washer from each end of the strut (Ref. Fig. 401). Remove the strut.

(c) Position a container under the hydraulic pipe connections in the roof of the intake; loosen the pipe union nuts.

(d) Remove the bolts and clamp securing the four hydraulic pipes.

(e) Position a container under the pipe connections on the actuator. Disconnect the pipes from the actuator; immediately fit suitable blanks to the pipes and adapters.

(f) Move the pipes clear of the actuator; hand-tighten the pipe union nuts in the roof of the intake.

(g) Remove the containers and any hydraulic fluid which may have been spilled.

(h) Remove the split pin, nut and washer from the special bolt (Ref. Fig. 401).

(i) Support the actuator; remove the special bolt and washer.

(j) Take the weight of the actuator and remove the support. Carefully lower the actuator the minimum amount to gain access to the solenoid, ensuring that no fouls occur and that no electrical cable or connector is placed under tension.

(k) Firmly support the actuator in this position.

(6) Place a cloth immediately beneath the appropriate solenoid, and place the container beneath the actuator to collect any residual hydraulic fluid.

C. Remove Solenoid and Distributor

(1) Disconnect the electrical connector from the solenoid.

(2) Remove the four bolts securing the solenoid

to the hydraulic distribution unit.

(3) Carefully disengage and remove the solenoid.

(4) Remove and discard the seal from the distributor.

(5) If required, remove the distributor as follows:-

(a) Carefully withdraw the distributor from the hydraulic distribution unit.

(b) Remove and discard the remaining seals from the distributor.

D. Install Solenoid and Distributor

(1) Ensure that the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.

(2) If applicable, install the distributor as follows:-

(a) Fit new seals to the distributor.

(b) Lightly lubricate the seals with clean hydraulic fluid.

(c) Align the distributor with the hole in the distribution unit. If the distributor is part of the of the main or standby system, position correctly the cut-out in the flange.

(d) Carefully ease the distributor into the distribution unit, ensuring that the seals are not damaged.

(3) Position the solenoid, complete with a new seal on the distributor, on the distribution unit and fit the bolts.

(4) Torque-tighten the bolts to between 36 and 44 lbf in (0.407 and 0.497 mdaN).

(5) Interlock the bolts, in pairs, with locking wire in accordance with 20-21-13.

(6) Connect the electrical connector to the solenoid, ensuring that the mating surfaces are clean and undamaged.

E. Conclusion

NOTE: Paragraphs (1) and (3) apply to the brake test solenoid and/or distributor only; all other paragraphs apply to the three solenoids/ distributors.

(1) Reinstate the actuator after installation of a brake test solenoid and/or distributor as follows:-

(a) Raise the rear end of the actuator, align the links and, with a countersunk washer under its head, insert the special bolt, ensuring that the bolt head is correctly placed (Ref. Fig. 401).

(b) Fit a washer and nut to the special bolt; torque-tighten the nut to between 215 and 240 R lbf in (2.429 and 2.712 mdaN). Fit a split pin, previously coated with sealant (Ref. 20-22-19).

(c) Position the strut (Ref. Fig. 401) between the fork of the special bolt and the structure brackets. With thin washers under their heads, insert the bolts, one each end of the strut.

(d) Fit the special thick washer, thin washer and nut to each bolt; torque-tighten the nuts to between 25 and 30 lbf in (0.282 and 0.339 mdaN). Fit a split pin, previously coated with sealant (Ref. 20-22-19).

(e) Remove the blanks from the hydraulic pipes and adapters. Connect the pipes to the actuator.

(f) Torque-tighten the union nuts at each end of the pipes in accordance with 20-23-11 and 20-23-12 and to the following values:-

f1) The smaller diameter union nuts: to between 160 and 180 lbf in (1.808 and 2.034 mdaN).

f2) The larger diameter union nuts: to between 300 and 420 lbf in (3.390 and 4.746 mdaN).

(g) Position the pipe clamp and fit the bolts. Torque-tighten the bolts to between 25 and 30 lbf in (0.282 and 0.339 mdaN). Wire-lock the bolts in accordance with 20-21-13.

(h) Connect each snubbing device link to the associated screwjack fork-end (Ref. Fig. 401), as follows:-

h1) Position the end of the link in the lugs of the fork-end.

h2) With a washer under its head, insert the bolt, from the top, to secure the link.

h3) Fit a washer and nut to the bolt; torque-tighten the nut to between 36 and 44 lbf in (0.407 and 0.497 mdaN); fit a split pin, previously coated with sealant (Ref. 20-22-19).

(2) Remove the container and the cloth from the actuator; remove any hydraulic fluid which may have been spilled.

(3) Bleed the actuator standby system downstream of the distributor, as follows:-

CAUTION: AFTER FITTING A BRAKE TEST SOLENOID AND/OR DISTRIBUTOR, THE STANDBY SYSTEM DOWNSTREAM OF THE DISTRIBUTOR MUST BE BLED TO PREVENT POSSIBLE DAMAGE TO THE FILTER IN THE DISTRIBUTOR.

(a) According to which actuator is to be bled, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.2.B.(6)):-

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(b) On the intake management panel, proceed as follows:-

b1) Remove the anti-interference plate.

b2) Check that the four RAMP/SPILL MASTER switches are at the MAN position.

b3) Set the appropriate HYD switch to "YELLOW".

(c) Make available electrical ground power as detailed in 24-41-00.

WARNING: THE PERSON CONTROLLING THE BLEEDING

OPERATION MUST ENSURE THAT THE INTAKE MANAGEMENT PANEL IS NOT LEFT UNGUARDED WHILST HYDRAULIC POWER IS APPLIED TO THE AIRCRAFT. IN ADDITION, PERSONS MUST BE EXCLUDED FROM THE INTERIOR OF THE FOUR INTAKES.

CAUTION: ENSURE THAT THE RAMPS OPERATING AREA IS CLEAR OF OBSTRUCTIONS.

(d) On the intake management panel, hold the appropriate RAMP switch at "RAISE".

(e) Pressurize fully the standby hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(f) Check that the ramps rise; continue to hold the RAMP switch at RAISE for not less than 2 min to bleed the actuator.

(g) Depressurize the standby hydraulic system.

(h) Trip the circuit breaker, reset in operation (a), and fit a safety clip.

(i) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(j) Fit the anti-interference plate to the intake management panel.

(k) Carry out a Functional Test of the actuator brake system as detailed in Adjustment/Test.

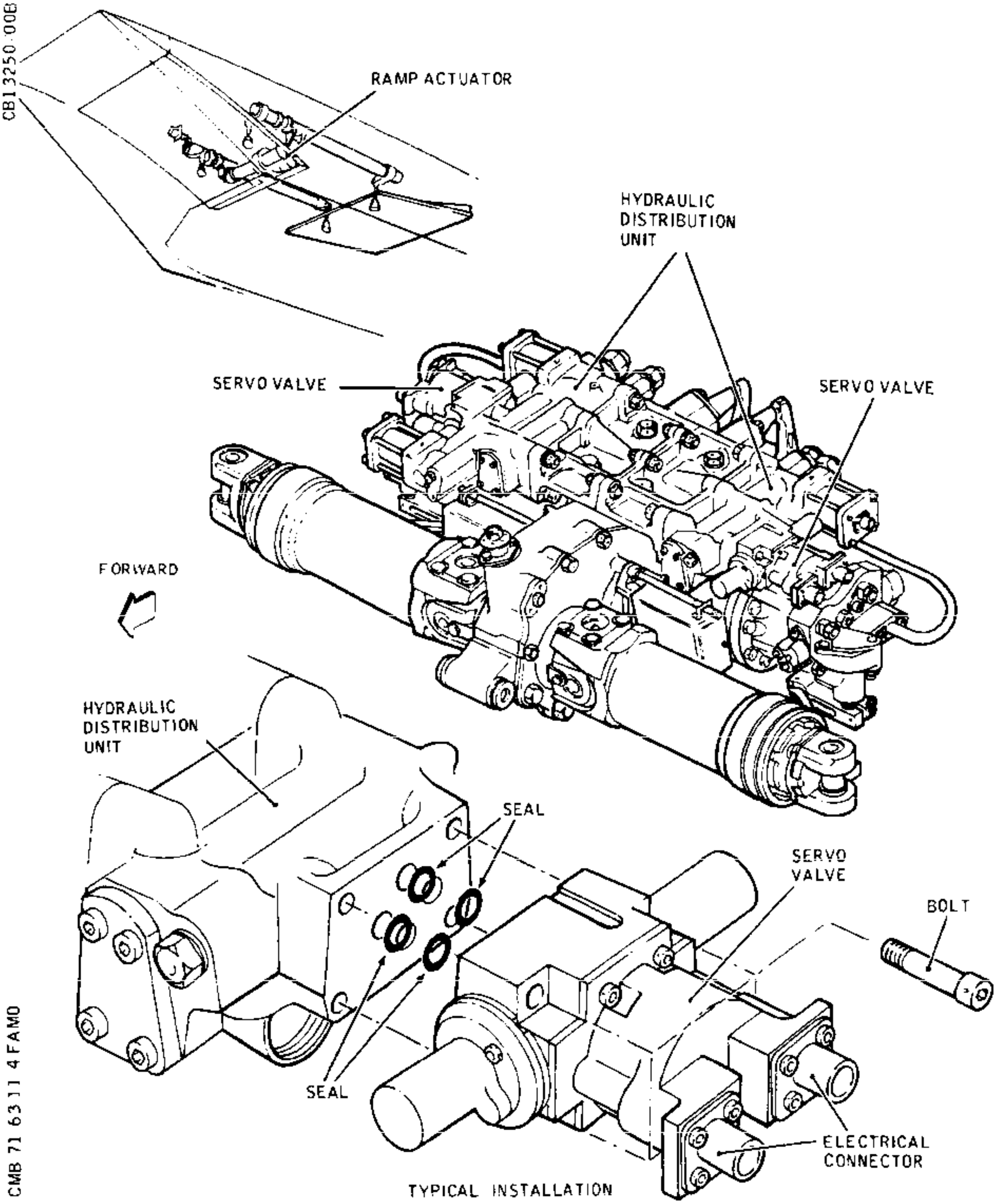
(4) Carry out a Functional Test of the actuator as detailed in Adjustment/Test.

7. Servo Valve (Ref. Fig. 406)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

CAUTION: EXTREME CARE MUST BE TAKEN TO ENSURE THAT FOREIGN MATTER IS NOT INTRODUCED INTO THE ACTUATOR.

A. Equipment and Materials



Servo Valve - Installation
Figure 406

DESCRIPTION	PART NO.
Container, for collecting hydraulic fluid	-
Brake release tool	E925089000
Torque spanner, 36 to 44 lbf in (0.407 to 0.497 mdaN)	-
Torque spanner, 25 to 30 lbf in (0.282 to 0.339 mdaN)	-
Torque spanner, 133 to 177 lbf in (1.503 to 2.000 mdaN)	-
Torque spanner, 160 to 180 lbf in (1.808 to 2.034 mdaN)	-
Torque spanner, 215 to 240 lbf in (2.429 to 2.712 mdaN)	-
Torque spanner, 300 to 420 lbf in (3.390 to 4.746 mdaN)	-
Clean lint-free cloth	-
R R Corrosion resistant steel wire 0.031 in (0.8mm)	DTD189

B. Prepare to Remove Servo Valve

<u>NOTE</u>: To gain access to remove either servo valve with the actuator in situ, it is necessary to disconnect or remove certain items and to swing the actuator downward about the forward attachment bolt.

(1) Carry out the procedures detailed in paragraphs 2.B.(2) to (11) and (13).

(2) Remove the brake release access plug from the brake unit (Ref. Fig. 401).

(3) Using the brake release tool as detailed on the attached label, disengage the brake; rotate the screwjack bodies to almost fully lower the ramps; following the instructions on the label in reverse

order, engage the brake and remove the release tool.

(4) Refit the plug to the brake unit. Torque-tighten the plug to between 133 and 177 lbf in (1.503 and 2.000 mdaN). Wire-lock the plug in accordance with 20-21-13.

(5) Gain access to either servo valve, as follows:-

(a) Remove the split pin, nut, washer, bolt and washer securing each snubbing device link to the screwjack fork-ends (Ref. Fig. 402).

(b) Remove the split pin, nut, thin washer, thick washer, bolt and washer from each end of the strut (Ref. Fig. 401). Remove the strut.

(c) Position a container under the hydraulic pipe connections in the roof of the intake; loosen the pipe union nuts.

(d) Remove the bolts and clamp securing the four hydraulic pipes.

(e) Position a container under the pipe connections on the actuator. Disconnect the pipes from the actuator; immediately fit suitable blanks to the pipes and adapters.

(f) Move the pipes clear of the actuator; hand-tighten the pipe union nuts in the roof of the intake.

(g) Remove the containers and any hydraulic fluid which may have been spilled.

(h) Remove the split pin, nut and washer from the special bolt (Ref. Fig. 401).

(i) Support the actuator; remove the special bolt and washer.

(j) Take the weight of the actuator and remove the support. Carefully lower the actuator the minimum amount to gain access to the valve, ensuring that no fouls occur and that no electrical cable or connector is placed under tension.

(k) Firmly support the actuator in this position.

(3) Place a cloth immediately beneath the appropriate servo-valve, and place the container beneath the actuator to catch any residual hydraulic fluid.

C. Remove Servo Valve

(1) Disconnect the electrical connectors from the servo valve.

(2) Remove the four bolts securing the servo valve to the hydraulic distribution unit.

(3) Carefully disengage and remove the servo valve. Remove and discard the seals.

D. Install Servo Valve

(1) Ensure that the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.

(2) Position the servo valve, complete with new seals, on the distribution unit and fit the four bolts.

(3) Torque-tighten the bolts to between 36 and 44 lbf in (0.407 and 0.497 mdaN).

(4) Interlock the bolts, in pairs, with locking wire in accordance with 20-21-13.

(5) Connect the electrical connectors to the servo valve, ensuring that the mating surfaces are clean and undamaged.

E. Conclusion

(1) Reinstate the actuator after installation of a servo valve, as follows:-

(a) Raise the rear end of the actuator, align the links and, with a countersunk washer under its head, insert the special bolt, ensuring that the bolt head is correctly placed (Ref. Fig. 401).

(b) Fit a washer and nut to the special bolt; torque-tighten the nut to between 215 and 240 lbf in (2.249 and 2.712 mdaN). Fit a split pin, previously coated with sealant (Ref. 20-22-19).

(c) Position the strut (Ref. Fig. 401) between the

fork of the special bolt and the structure bracket. With thin washers under their heads, insert the bolts, one each end of the strut.

(d) Fit the special thick washer, thin washer and nut to each bolt; torque-tighten the nuts to between 25 and 30 lbf in (0.282 and 0.339 mdaN). Fit a split pin, previously coated with sealant (Ref. 20-22-19).

(e) Remove the blanks from the hydraulic pipes and adapters. Connect the pipes to the actuator.

(f) Torque-tighten the union nuts at each end of the pipes in accordance with 20-23-11 and 20-23-12 and to the following values:-

f1) The smaller diameter union nuts: to between 160 and 180 lbf in (1.808 and 2.034 mdaN).

f2) The larger diameter union nuts: to between 300 and 420 lbf in (3.390 and 4.746 mdaN).

(g) Position the pipe clamp and fit the bolts. Torque-tighten the bolts to between 25 and 30 lbf in (0.282 and 0.339 mdaN). Wire-lock the bolts in accordance with 20-21-13.

(h) Connect each snubbing device link to the associated screwjack fork-end (Ref. Fig. 401), as follows:-

h1) Position the end of the link in the lugs of the fork-end.

h2) With a washer under its head, insert the bolt, from the top, to secure the link.

h3) Fit a washer and nut to the bolt; torque-tighten the nut to between 36 and 44 lbf in (0.407 and 0.497 mdaN); fit a split pin, previously coated with sealant (Ref. 20-22-19).

(2) Remove the container and the cloth from the actuator; remove any hydraulic fluid which may have been spilled.

(2) Carry out a Functional Test as detailed in Adjustment/Test.

8. Resolver Unit (Ref. Fig. 407)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

CAUTION: EXTREME CARE MUST BE TAKEN TO ENSURE THAT FOREIGN MATTER IS NOT INTRODUCED INTO THE ACTUATOR.

A. Equipment and Materials

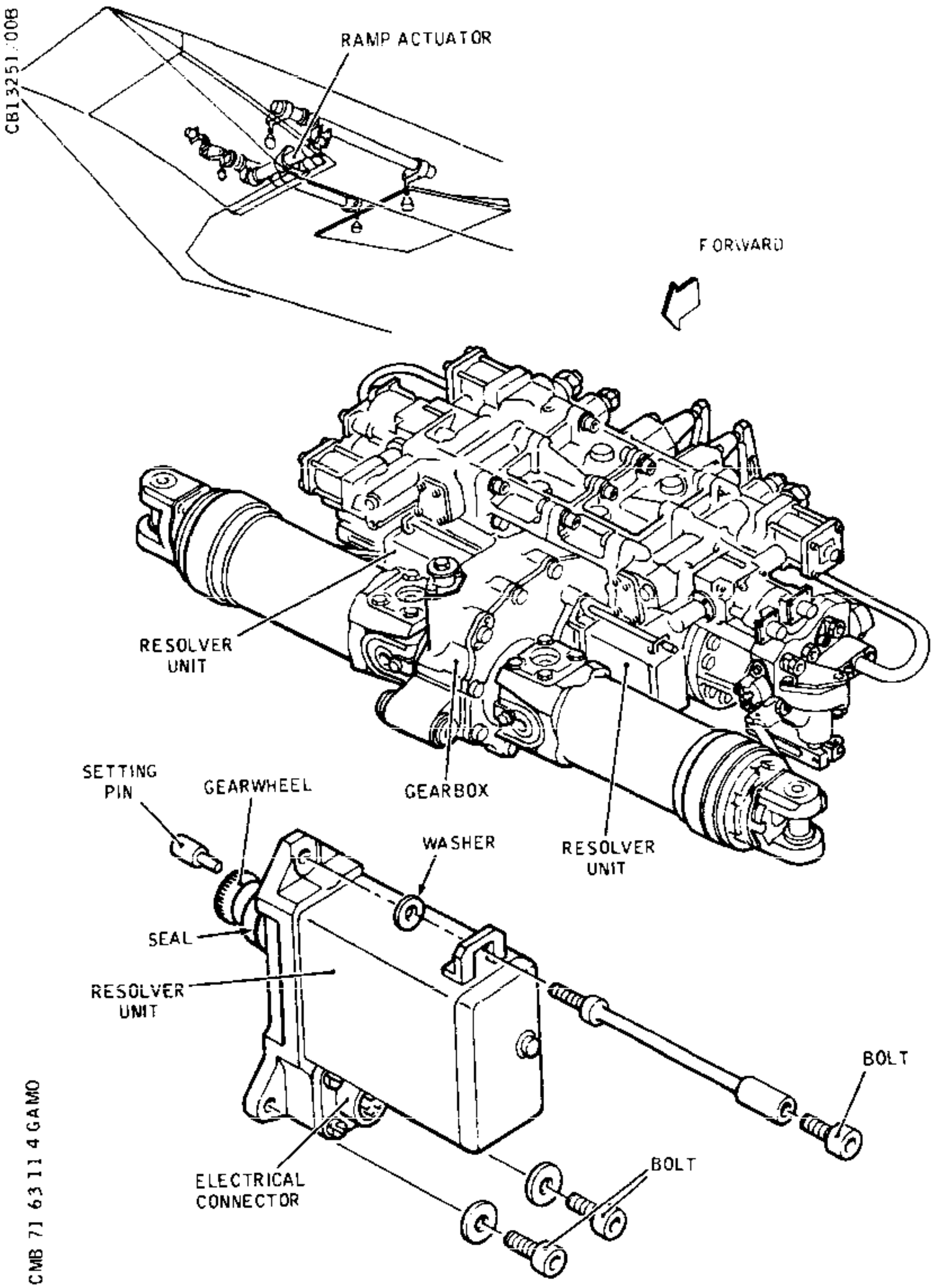
DESCRIPTION	PART NO.
Torque spanner, 12 to 15 lbf in (0.136 to 0.169 mdaN)	-
Torque spanner, 36 to 44 lbf in (0.407 to 0.497 mdaN)	-
Torque spanner, 133 to 177 lbf in (1.503 and 2.000 mdaN)	-
Ramp actuator gauge (mid-stroke setting)	E925053000
Brake release tool	E925089000
Resolver test set (includes power loom Pt. No.TE6049201 and ramp resolvers loom Pt. No.TE6049202)	TE6049000
R R Corrosion resistant steel wire 0.031 in (0.8mm)	DTD189

B. Prepare to Remove Resolver Unit

(1) Carry out the procedures detailed in paragraphs 2.B.(2) to (11).

(2) Remove the brake access release plug from the brake unit (Ref. Fig. 401).

(3) Using the brake release tool as detailed on the attached label, disengage the brake; rotate the screwjack bodies until the ramp actuator gauge is a sliding fit between each screwjack body and the face of the associated fork-end. Using the brake release



Resolver Unit - Installation
Figure 407

tool, following the instructions on the label in reverse order, engage the brake when the screwjacks are in the exact mid-stroke position. Remove the release tool.

(4) Refit the plug to the brake unit. Torque-tighten the plug to between 133 and 177 lbf in (1.503 and 2.000 mdaN). Wire-lock the plug in accordance with 20-21-13.

C. Remove Resolver Unit

(1) Disconnect the electrical connector from the resolver unit.

(2) Remove the bolts and cable clip securing the loom to the snubbing device.

(3) Remove the three bolts and washers securing the unit to the gearbox.

(4) Carefully disengage and remove the unit from the gearbox. Remove and discard the seal.

D. Prepare to Install Resolver Unit

CAUTION: THE ACTUATOR MUST BE SET IN THE EXACT MID-STROKE POSITION BEFORE THE RESOLVER UNIT IS FITTED, OTHERWISE ERRONEOUS ELECTRICAL SIGNALS WILL RESULT.

(1) Using the ramp actuator gauge, ensure that each screwjack is set in the mid-stroke position.

E. Install Resolver Unit

(1) Ensure that the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.

(2) Fit a new seal to the unit.

(3) Remove the setting pin and retain it with the old unit; carefully align the unit and insert the gearwheel into the gearbox, ensuring that the gear teeth mesh correctly with those in the gearbox.

(4) Fit the three bolts and washers.

(5) Torque-tighten the bolts to between 36 and 44 lbf in (0.407 and 0.497 mdaN). Lock the bolts with wire in accordance with 20-21-13.

(6) Check that the resolver signals for the mid-stroke setting are correct, as follows:-

(a) Connect the resolver test set as follows:-

a1) Ensure that the ON - OFF switch on the test set is at the OFF position.

a2) Connect the appropriate end of the power loom to the connector PL1 on the test set and connect the other end to a 115 V 400 Hz electrical supply.

a3) Connect the single end of the ramp resolver loom to the connector PL2 on the test set and connect the appropriate tails, identified by the attached labels, to the resolvers.

a4) On the test set, set the RESOLVER SELECT switch to "MAIN CONTROL".

a5) Set the ON - OFF switch to "ON"; check that the angle position indicator is illuminated.

(b) With the RESOLVER SELECT switch at MAIN CONTROL, check that the angle position indicator (API) displays 0 deg (360 deg) (±8 min).

(c) Set the RESOLVER SELECT switch to "MAIN MONITOR"; check that the API displays 0 deg (360 deg) (±8 min).

(d) Set the RESOLVER SELECT switch to "ALT CONTROL"; check that the API displays 90 deg (±8 min).

(e) Set the RESOLVER SELECT switch to "ALT MONITOR"; check that the API displays 90 deg (±8 min).

(f) Switch off the resolver test set and disconnect it from the unit.

(g) Connect the electrical connector to the resolver unit, ensuring that the mating surfaces are clean and undamaged.

(h) Position the loom and cable clip on the snubbing device and fit the bolts. Torque-tighten the bolts to between 12 and 15 lbf in (0.136 and 0.169 mdaN). Wire-lock the bolts in accordance

with 20-21-13.

F. Conclusion

(1) Carry out a Functional Test as detailed in Adjustment/Test.

(2) Carry out the appropriate Preliminary Test as detailed in 71-61-00, Adjustment/Test, '3. Operational Test (Excluding Ramp Manual Inching, Spill Door Manual Inching and Auxiliary Inlets).

9. Brake Unit (Ref. Fig. 408)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

CAUTION: EXTREME CARE MUST BE TAKEN TO ENSURE THAT FOREIGN MATTER IS NOT INTRODUCED INTO THE ACTUATOR.

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner, 80 to 97 lbf in (0.904 to 1.096 mdaN)	-
R Corrosion resistant steel wire 0.031 in (0.8mm)	DTD189

B. Prepare to Remove Brake Unit

(1) Carry out the procedures detailed in paragraphs 2.B.(2) to (11).

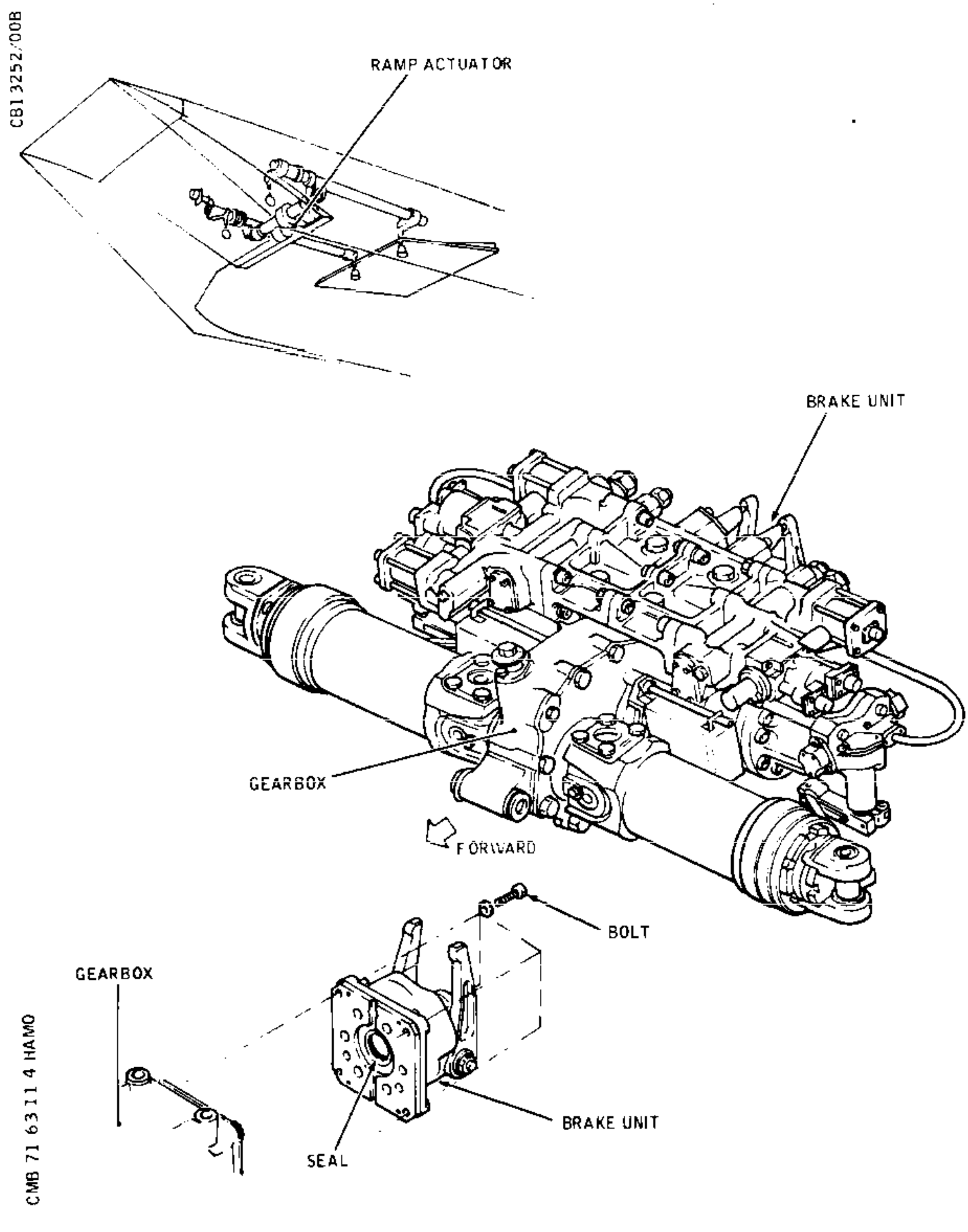
C. Remove Brake Unit

(1) Remove the four bolts securing the brake unit to the gearbox.

(2) Remove the brake unit. Remove and discard the seal.

D. Install Brake Unit

(1) Ensure that the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.



Brake Unit - Installation
Figure 408

(2) Position the brake unit, complete with a new seal, on the gearbox, ensuring that the splines are correctly engaged; fit the four bolts.

(3) Torque-tighten the bolts to between 80 and 97 lbf in. (0.904 to .096 mdaN).

(4) Lock the bolts with locking wire in accordance with 20-21-13.

E. Conclusion

(1) Carry out a Functional Test of the actuator brake system followed by a Functional Test of the actuator as detailed in Adjustment/Test.

RB F. Replace Brake Piston Cover Retention Bolts

RB (1) Observe cautions, lower ramp as required for access
RB and carry out preparations as detailed in 71-63-00/
RB 301 Paras 2.A. and B.

RB (2) Remove locking wire from brake piston cover retaining
RB bolts.

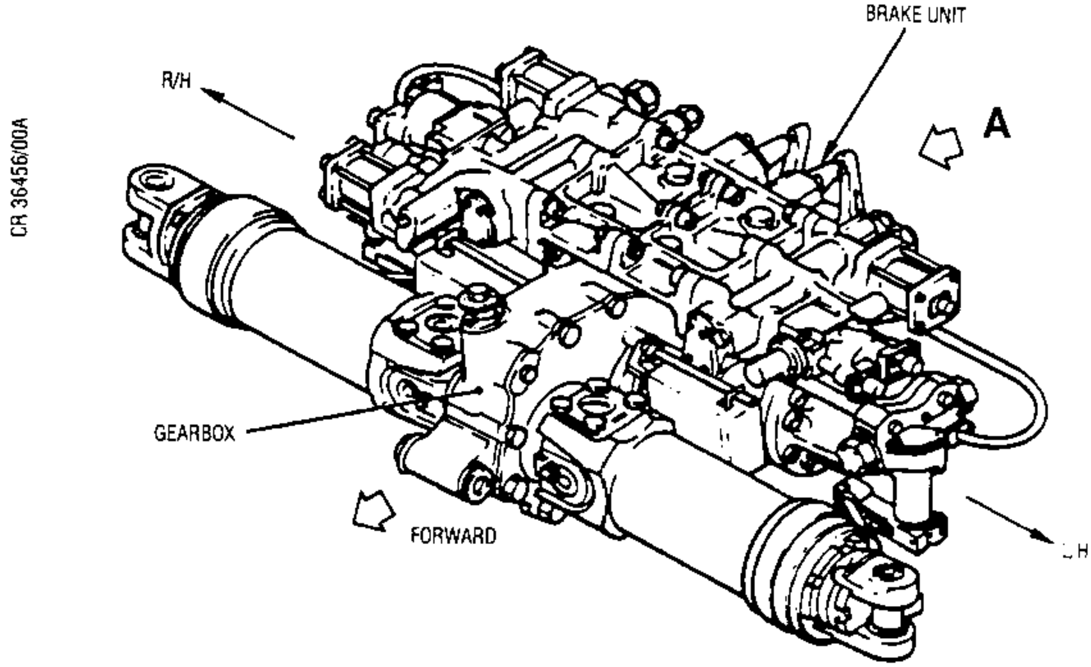
RB NOTE: Ensure all wire is removed from the intake.

RB (3) Replace brake bolts, one at a time to minimise fluid
RB loss, torque tighten to 5.6 to 6.9 lbf/ft. Wire lock
RB as Fig.409.

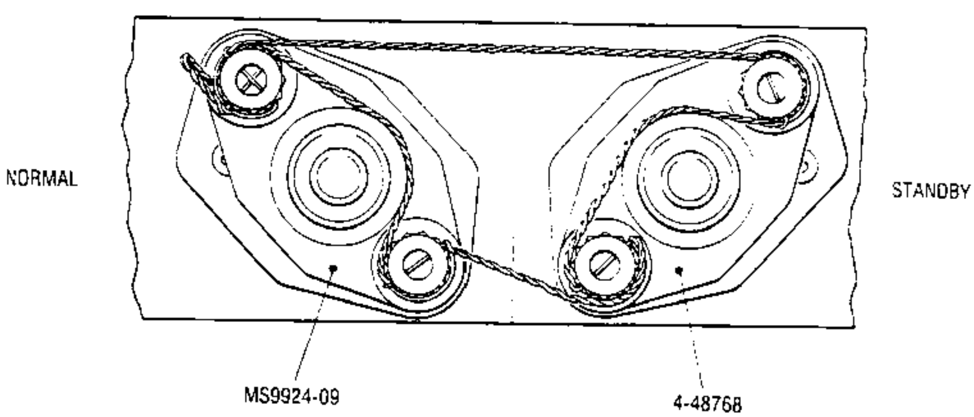
RB CAUTION: ENSURE THE INTAKE IS CLEAR OF TOOLS,
RB EQUIPMENT, DEBRIS AND PERSONNEL.

RB (4) Do a function and leak check using the associated
RB main and standy hydraulic systems in accordance
RB with 71-63-11/500.

RB (5) Do a function test of the actuator brake system
RB in accordance with 71-63-11/500.



VIEW ON ARROW **A**



Brake Piston Cover Retention Bolts
Figure 409

R

RAMP ACTUATOR - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 and 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

This topic comprises three Functional Tests under the following headings:-

Functional Test - Using Test Set (including brake test)

Functional Test - Using AICS Inching Facility (no brake test)

Functional Test - Actuator Brake (without using test set)

The first two of the above-mentioned Functional Tests confirm that the actuator is operating correctly in accordance with applied electrical signals and hydraulic power supply, and also that the actuator raises and lowers the ramps within specified times.

The third Functional Test (actuator brake) is a means of checking that the brake is operating, without using the test set. Power for this Test is controlled by the AICS inching facility.

It is not necessary to perform the Functional Test using the test set if it is known that the rate of operation of the actuator with a 14 mA current input to the servo valve is satisfactory, and if the operation of the brake unit is known to be satisfactory.

The Functional Test using the AICS inching facility must be

carried out to check the integrity of the electrical system,, whether or not the test set is used.

When the test set is used, control is effected by the test set, with indication at the air intake management panel (Ref. 71-61-00).

When the AICS inching facility is used, control and indication of the ramps movement is effected at the air intake management panel. The person controlling the actuator must remain at the panel (to prevent inadvertent operation) whenever the anti-interference plate is not fitted.

Operational Test requirements are satisfied by the Operational Test carried out in 71-61-00, Adjustment/Test. A System Test is not applicable in this instance.

In the interest of safety, all persons not connected with the test must be excluded from the areas around the four intakes.

2. Functional Test - Using Test Set

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Test set, for operating actuator R (includes power loom R Pt. No.TE6043203 and ramp loom R Pt. No.TE6043201)	TE6043000
Stopwatch	-

B. Prepare

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out inside the intakes.

(4) On the intake management panel, proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the main system, i.e., "GREEN" or "BLUE".

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins to the spill door hydraulic selector valves of the four intakes (Ref. 71-62-00, Servicing).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

(8) Fit, and secure, the protective cover to the intake lip.

(9) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(10) Place the crawling board on the floor of the intake, aft of the servicing extension.

(11) Fit the cover to the engine transition ring.

C. Test

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED.

(1) Ensure that all equipment is clear of moving parts.

(2) Carry out an operation, rate and brake check of the actuator, as follows:-

(a) Disconnect the electrical connectors from the two servo valves and the three selector valve solenoids.

R (b) Connect the single end of the ramp loom to
R the connector PL1 on the test set and connect
R the five tails to their servo and selector
R valves in accordance with the identification
R label on each tail.

(c) Set the switches on the test set as follows:-

c1) MAIN DRIVE - ALT DRIVE to "MAIN DRIVE".

c2) UP - DOWN to centre (off).

R c3) HYDRAULIC SELECTION MAIN - STANDBY to
R "MAIN".

c4) OFF - LOCK TEST to "OFF".

c5) ON - OFF to "OFF".

R (d) Using the power loom, connect an electrical
R 28 V d.c. supply to the test set connector
R PL2 and set the ON - OFF switch to "ON".
Check that the following lamps are lit:-

d1) 28 V SUPPLY.

d2) SYSTEM CONNECTED - RAMP.

(e) Adjust the test set to produce a 14 mA current

supply to the servo valve.

(f) Pressurize fully the appropriate main hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with the test.

(g) Press and hold the ENERGIZE button switch; check that the HYDRAULIC SELECTION - MAIN lamp is lit. With the ENERGIZE switch held pressed, hold the UP - DOWN switch at "UP" to ensure that the ramps are fully raised; check that the position indicator displays 0 per cent. Set the switch to the centre (off) position and release the ENERGIZE switch.

CAUTION: ENSURE THAT SNUBBING OCCURS, OTHERWISE THE ACTUATOR WILL REACH ITS END-OF-STROKE POSITION AT FULL SPEED; THIS WILL RESULT IN DAMAGE.

IF SNUBBING IS NOT EVIDENT, THE FAULT MUST BE RECTIFIED BEFORE PROCEEDING.

(h) Press and hold the ENERGIZE switch. Observing the position indicator, simultaneously start the stopwatch and hold the UP - DOWN switch at "DOWN". Check that the time taken for the indicator to display 100 per cent and for the ramps to be fully lowered, including snubbing, is not more than 3 s. Set the switch to the centre (off) position and release the ENERGIZE switch.

NOTE: Snubbing must be observed visually, and is recognized by the sudden reduction in the rate of ramps movement as the actuator nears its end-of-stroke position.

(i) Press and hold the ENERGIZE switch. Simultaneously start the stopwatch and hold the UP - DOWN switch at "UP". Check that the time taken for the indicator to display 0 per cent and for the ramps to be fully raised, including snubbing, is not more than 3 s. Set the switch to the centre (off) position and release the ENERGIZE switch.

(j) Set the MAIN DRIVE - ALT DRIVE switch to "ALT DRIVE".

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(k) Repeat operations (h) and (i).

(l) Depressurize the main hydraulic system.

R (m) Set the HYDRAULIC SELECTION MAIN - STANDBY
R switch to "STANDBY"; check that the HYDRAULIC
R SELECTION - MAIN lamp is out.

(n) Pressurize fully the standby hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with the test.

(o) Press and hold the ENERGIZE switch; check that the HYDRAULIC SELECTION - STANDBY lamp is lit. Repeat operations (h) and (i).

(p) Set the MAIN DRIVE - ALT DRIVE switch to "MAIN DRIVE".

(q) Repeat operations (h) and (i).

(r) Set the OFF - LOCK TEST switch to "LOCK TEST".

(s) Hold the UP - DOWN switch at "DOWN". Check that the ramps do not move. Set the switch to the centre (off) position.

(t) Depressurize the standby hydraulic system.

(u) Switch off and disconnect the electrical power supply to the test set.

D. Conclusion

(1) Disconnect the test set looms from the actuator.

(2) Connect the electrical connectors to the actuator, ensuring that the mating surfaces are clean and undamaged.

(3) Carry out a Functional Test, using the AICS inching facility (Ref. para.3.).

3. Test - Using AICS Inching Facility

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 501.

A. Equipment and Materials

DESCRIPTION	PART NO.
Stopwatch	-

B. Prepare

(1) Carry out operations 2.B.(1) to (11).

C. Test

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THOSE CIRCUIT BREAKERS RESET IN THE FOLLOWING PROCEDURES.

(1) Ensure that all equipment is clear of moving parts.

(2) Carry out an operation and rate check as follows:-

(a) According to which ramps are being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.2.B.(6)).

INT (1, 2, 3 or 4) MAIN HYD SUP

WARNING: THE PERSON RESPONSIBLE FOR CONTROLLING THE TEST MUST ENSURE THAT THE INTAKE MANAGEMENT PANEL IS NOT LEFT UNGUARDED UNTIL THE TEST IS CONCLUDED.

(b) Make available electrical ground power as detailed in 24-41-00.

(c) Remove the anti-interference plate from the intake management panel.

(d) Pressurize fully the appropriate main hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

CAUTION: ENSURE THAT SNUBBING OCCURS, OTHERWISE THE ACTUATOR WILL REACH ITS END-OF-STROKE POSITION AT FULL SPEED; THIS WILL RESULT IN DAMAGE.

IF SNUBBING IS NOT EVIDENT, THE FAULT MUST BE RECTIFIED BEFORE PROCEEDING.

(e) On the intake management panel, hold the appropriate RAMP switch at "LOWER", checking that the ramps move smoothly and that snubbing occurs just before the ramps are fully lowered. Release the switch.

NOTE: Snubbing is recognized by the sudden reduction in the rate of the ramps movement as the actuator nears its end-of-stroke position.

(f) Hold the RAMP switch at "RAISE", checking that the ramps move smoothly and that snubbing occurs just before the ramps are fully raised. Release the switch.

(g) Hold the RAMP switch at "RAISE" to ensure that the ramps are fully raised; check that the position indicator displays 0 per cent. Release the switch.

(h) Observing the position indicator, simultaneously start the stopwatch and hold the RAMP switch at "LOWER". Check that the time taken for the indicator to display 100 per cent and for the ramps to be fully lowered, including snubbing, is between 4.9 and 5.4 s. Check that the ramps move smoothly throughout their travel. Release the switch.

(i) Simultaneously start the stopwatch and hold the RAMP switch at "RAISE". Check that the time taken for the indicator to display 0 per cent and for the ramps to be fully raised, including snubbing, is between 7.5 and 8.9 s. Check that the ramps move smoothly throughout their travel. Release the switch.

(j) Depressurize the main hydraulic system. Trip and safety-clip the circuit breaker reset in operation (a).

(k) Check the actuator and associated pipes for

hydraulic fluid leakage.

(l) According to which ramps are being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.2.B.(6)).

INT (1, 2, 3 or 4) ST'BY HYD SUP

(m) On the intake management panel, set the appropriate HYD switch to "YELLOW".

(n) Pressurize fully the standby hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(o) On the intake management panel, hold the RAMP switch at "LOWER", checking that the ramps move smoothly and that snubbing occurs just before the ramps are fully lowered. Release the switch.

(p) Hold the RAMP switch at "RAISE", checking that the ramps move smoothly and that snubbing occurs just before the ramps are fully raised. Release the switch.

(q) Hold the RAMP switch at "RAISE" to ensure that the ramps are fully raised; check that the position indicator displays 0 per cent. Release the switch.

(r) Observing the position indicator, simultaneously start the stopwatch and hold the RAMP switch at "LOWER". Check that the time taken for the indicator to display 100 per cent and for the ramps to be fully lowered, including snubbing, is between 4.9 and 5.4 s. Check that the ramps move smoothly throughout their travel. Release the switch.

(s) Simultaneously start the stopwatch and hold the RAMP switch at "RAISE". Check that the time taken for the indicator to display 0 per cent and for the ramps to be fully raised, including snubbing, is between 7.5 and 8.9 s. Check that the ramps move smoothly throughout their travel. Release the switch. Leave the ramps in the fully raised position.

(t) Depressurize the standby hydraulic system. Trip

and safety-clip the circuit breaker reset in operation (l).

(u) Check the actuator and associated pipes for fluid leakage.

D. Conclusion

(1) Switch off and disconnect electrical ground power as detailed in 24-41-00.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (2), THOROUGHLY CHECK THE INTAKE INTERIOR FOR DEBRIS AND LOOSE OBJECTS.

(2) Remove all tools and equipment from the intake, and ensure that the intake interior is clean.

(3) Remove the locking pins from the main and standby hydraulic selector valves of the four intakes.

(4) At the intake management panel, proceed as follows:-

(a) If applicable, remove the anti-interference plate.

(b) Set the four HYD switches to "AUTO".

(c) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(5) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(6) Remove the warning placard from the engine start panel.

(7) Remove the barriers from the intake entries and from beneath the spill doors.

(8) Carry out the appropriate Preliminary Test as detailed in 71-61-00, Adjustment/Test, '3. Operational Test (Excluding Ramp Manual Inching, Spill Door Manual Inching and Auxiliary Inlets)'.

4. Functional Test - Actuator Brake

A. Prepare

(1) Carry out operations 2.B.(1) to (7).

B. Test

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN THE POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(1) Ensure that all equipment is clear of moving parts.

(2) Depending on which actuator brake is to be tested, remove the safety clip and reset the INT 1, INT 2, INT 3 or INT 4 ST'BY HYD SUP circuit breaker (Ref. para.2.B.(6)).

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Remove the anti-interference plate from the intake management panel.

WARNING: THE PERSON RESPONSIBLE FOR CONTROLLING THE TEST MUST ENSURE THAT THE PANEL IS NOT LEFT UNGUARDED UNTIL THE TEST IS CONCLUDED.

(5) Pressurize fully the standby (yellow) hydraulic system, with the application of power controlled by a responsible person associated with the test.

(6) At the intake management panel, set the appropriate HYD selector switch to "YELLOW".

(7) Test the brake of the ramp actuator in the appropriate intake, as follows:-

(a) Hold the appropriate RAMP switch at "LOWER" until the ramps are at the 50 per cent (approxinately) position. Release the switch.

(b) Refer to Table 501. Using a suitable adapter, link pins a and b of the appropriate TEST connector on the interface unit.

(c) Hold the RAMP switch at "RAISE" and then "LOWER"; check that the ramps do not move, in either direction. Release the switch.

INTAKE	ZONE	INTERFACE UNIT	TEST CONNECTOR	PINS
1	4-243	NO.2	1B	a and b
2	5-243	NO.1	2B	a and b
R 3	5-244	NO.4	3B	a and b
R 4	4-244	NO.3	4B	a and b

Brake Test - Pins Location
Table 501

(d) Remove the link adapter from the TEST connector.

(e) Hold the RAMP switch at "RAISE" until the ramps are at 0 per cent. Release the switch.

(8) Depressurize the hydraulic system.

(9) Switch off and disconnect electrical ground power as detailed in 24-41-00.

C. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (1), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(1) Remove all tools and equipment from the intake, and ensure that the intake interior is clean.

(2) Remove the locking pins from the main and standby hydraulic selector valves of the four intakes.

(3) At the intake management panel, proceed as follows:-

(a) If applicable, remove the anti-interference plate.

(b) Set the four HYD switches to "AUTO".

(c) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(4) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(5) Remove the warning placard from the engine start panel.

(6) Remove the barriers from the intake entries and from beneath the spill doors.

RAMPS - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

IN ADDITION, IT MUST BE ENSURED THAT HYDRAULIC POWER IS NOT APPLIED TO THE APPROPRIATE MAIN (GREEN OR BLUE) SYSTEM AND THE STANDBY (YELLOW) SYSTEM.

CAUTION: THE RAMPS ARE BONDED HONEYCOMB STRUCTURES AND MUST BE TREATED WITH CARE TO AVOID DAMAGE.

1. General

This topic contains the removal and installation procedures for the ramps and associated components, under the following headings:-

Front Ramp

Rear Ramp (including rear ramp fairing)

Rear Ramp Leading Edge

Links (front and rear ramps)

Front Ramp Links - Emergency Removal

The procedures apply to all intakes, differing only where stated.

2. Front Ramp

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Protective cover, for intake lip	D926806000
Servicing extension (springboard)	-
Work stand	-
Crawling board	-
Cover, for engine transition ring	D935036001
Support block for front ramp	D925453000
Brake release tool	E925089000
Torque spanner, 20 to 25 lbf in (0.226 to 0.282 mdaN)	-
Torque spanner, 40 to 50 lbf in (0.452 to 0.565 mdaN)	-
Torque spanner, 220 to 350 lbf in (2.486 to 3.955 mdaN)	-
Torque spanner, 133 to 177 lbf in (1.503 to 2.000 mdaN)	-
Push-pull gauge, 0 to 70 lbf (0 to 311.376 N)	-
Jointing compound, Mastinox (Ref.20-30-00, No.121 or 134)	-
Never-Seez grease (Ref.20-30-00, No.62)	CM145

B. Prepare to Remove Front Ramp

(1) Ensure that the four intakes are clear of personnel and equipment.

(2) Position barriers to prevent persons from inadvertently entering the areas below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out inside the intakes.

(4) On the intake management panel proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins to the spill door hydraulic selector valves of the four intakes (Ref. 71-62-00, Servicing).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
LH CYCLIC TIMER CONT	3-213	1H1835	B11

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
WINGS & INTS NORM CONT	15-215	1H1836	D10
WINGS & INTS ALT CONT	15-216	2H1836	E14
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
LH CYCLIC TIMER CONT	3-213	1H1835	B11
WINGS & INTS NORM CONT	15-215	1H1836	D10
WINGS & INTS ALT CONT	15-216	2H1836	E14
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
RH CYCLIC TIMER CONT	15-216	2H1835	D14
WINGS & INTS NORM CONT	15-215	1H1836	D10
WINGS & INTS ALT CONT	15-216	2H1836	E14
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6
RH CYCLIC TIMER CONT	15-216	2H1835	D14
WINGS & INTS NORM CONT	15-215	1H1836	D10
WINGS & INTS ALT CONT	15-216	2H1836	E14

(8) Fit, and secure, the protective cover to the intake lip.

(9) Position the work stand in front of the intake; place the servicing extension in the intake,

resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(10) Place the crawling board on the floor of the intake, aft of the servicing extension.

(11) Fit the cover to the engine transition ring.

NOTE: Operation (12) is applicable if power can be used to lower the ramps. If power cannot be used, operation (12) must be ignored and the ramps manually lowered, as detailed in paragraph (13).

(12) If applicable, lower the ramps under power, as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) According to which hydraulic system is to be used and which ramps are being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para. (6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or
INT (1, 2, 3 or 4) ST'BY HYD SUP

(b) Make available electrical ground power as detailed in 24-41-00.

(c) Pressurize the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(d) At the intake management panel, remove the anti-interference plate; hold the appropriate RAMP switch at "LOWER" until the ramps are fully lowered. Release the switch.

(e) Depressurize the hydraulic system.

(f) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(g) Trip the circuit breakers reset in operation (a) and fit safety clips.

(h) Refit, and lock, the anti-interference plate to the intake management panel.

(13) If applicable, manually lower the ramps as follows:-

(a) Remove the plug from the brake unit on the actuator (Ref. 71-63-11).

(b) Using the brake release tool as detailed on the instruction label, disengage the brake.

(c) Rotate the screwjack bodies until the ramps are fully lowered.

(d) Using the brake release tool (in the reverse order of operation (b)), engage the brake. Remove the brake release tool.

(e) Fit the plug to the brake unit; torque-tighten the plug to between 133 and 177 lbf in (1.503 and 2.000 mdaN). Wire-lock the plug in accordance with 20-21-13.

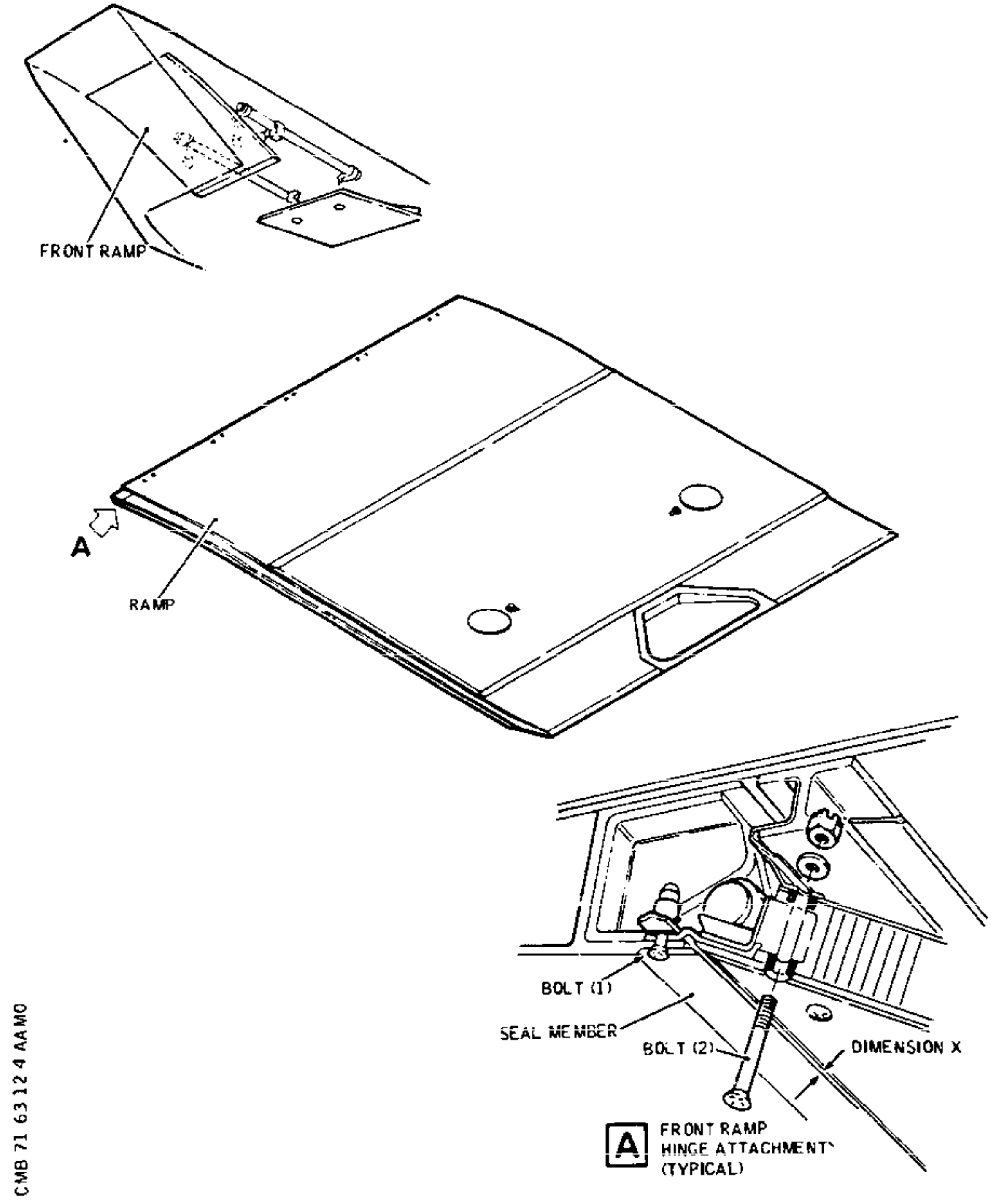
CAUTION: FAILURE TO USE THE BLOCK IN OPERATION (14), MAY RESULT IN DAMAGE TO THE RAMP AND/OR STRUCTURE.

(14) Position the support block on which to rest the ramp when the links are disconnected.

C. Remove Front Ramp (Ref. Fig. 401)

CAUTION: DURING REMOVAL DO NOT HANDLE THE RAMP BY ITS LINKS, OR PLACE THE RAMP, LINKS DOWNWARD, SO THAT WEIGHT IS TAKEN BY THE LINKS, OTHERWISE DAMAGE MAY BE CAUSED TO THE SPHERICAL BEARING HOUSING IN THE LINK LOWER EYE-END. REFER TO THE FOLLOWING NOTE.

NOTE: With reference to the above CAUTION, possible damage consists of local peening of the spherical bearing housing in line with the axis of the spherical bearing link pin, caused



Front Ramp - Installation
Figure 401

by impact of the bearing housing on the link housing. Such damage will impair the movement of the ramp link on its spherical bearing and necessitate the renewal of the ramp link (or eye-end).

(1) Remove the split pins, nuts and washers from the bolts securing the links to the torque tube levers (Ref. Fig. 404). Support the trailing edge of the ramp and remove the two bolts; lower the ramp on to the support block.

CAUTION: DO NOT REMOVE THE BOLTS SECURING THE HINGES TO THE STRUCTURE.

(2) Support the leading edge of the ramp and remove the split pins, nuts and bolts (2) securing the ramp to the hinges. Disengage the ramp from the hinges, ensuring that the seal is not damaged.

(3) Remove the ramp from the intake and place it on a suitable stand.

(4) If required, remove each link from the front ramp, as detailed in paragraph 5.

D. Prepare to Install Front Ramp

(1) If applicable, connect the links to the ramp as detailed in paragraph 5.

E. Install Front Ramp (Ref. Fig. 401)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

CAUTION: DURING INSTALLATION DO NOT HANDLE THE RAMP BY ITS LINKS, OR PLACE THE RAMP, LINKS DOWNWARD, SO THAT WEIGHT IS TAKEN BY THE LINKS, OTHERWISE DAMAGE MAY BE CAUSED TO THE SPHERICAL BEARING HOUSING IN THE LINK LOWER EYE-END. REFER TO THE FOLLOWING NOTE.

NOTE: With reference to the above CAUTION, possible damage consists of local peening of the spherical bearing housing in line with the axis of the spherical bearing link pin, caused by impact of the bearing housing on the link housing. Such damage will impair the movement of the ramp link on its spherical bearing and necessitate the renewal of the ramp link (or eye-end).

(1) Ensure that the safety precaution taken in operations B.(2) to (7) have not been cancelled.

(2) Apply Mastinox compound to the face of the hinges where they enter the ramp, and to the bolts (2). Position the ramp, ensuring that the seal is correctly placed, and engage the ramp with the hinge. Fit the bolts (2) (using hand pressure) washers and nuts. Torque-tighten each nut to between 40 and 50 lbf in (0.452 and 0.565 mdaN). Fit split pins.

RB NOTE: On intake ramps repaired in accordance with
RB EOI-COM-5467211, longer bolts are fitted at the
RB repair plate locations (E01-CON-5467395
RB refers).

(3) Cover all hinge pivots with Never-Seez grease to form dust seals.

(4) Raise and lower the ramp and check for free and smooth operation about the hinge.

(5) Suitably protect the trailing edge of the ramp, approximately central, where the push-pull gauge will be applied.

NOTE: In operations (6) and (7), the push-pull gauge must be used at 90 deg to the ramp centre line, and must follow the arc of the ramp travel, approximately.

(6) Using the push-pull gauge, push the ramp fully up. Check throughout the ramp movement that the force required does not exceed 70 lbf (311.376 N).

(7) Using the push-pull gauge, pull the ramp fully down. Check throughout the ramp movement that the force required does not exceed 20 lbf (88.965 N).

(8) Remove the protective covering from the ramp trailing edge.

(9) Raise the trailing edge of the ramp and position the links in the torque tube levers (Ref. Fig. 404). Fit the bolts (with their heads against the lugs), washers and nuts. Torque-tighten the nuts to between 220 and 350 lbf in (2.486 and 3.955 mdaN).

CAUTION: IN OPERATION (10), THE SPLIT PIN LEGS MUST NOT BE BENT OVER THE END OF THE BOLTS.

(10) Fit the split pin to each nut. Turn the legs in opposite directions around the nut and press the legs hard against the nut to prevent the split pin

from turning. Encapsulate the head and legs of both split pins with sealant in accordance with 20-22-19.

(11) Position the seal member and fit the bolts (1); torque-tighten the bolts to between 20 and 25 lbf in (0.226 and 0.282 mdaN).

(12) Check that the gap between the seal member and the reinforcing plate on the ramp bottom skin (dimension X) (Ref. Fig. 401) is between 0.020 and 0.050 in (0.508 and 1.270 mm).

NOTE: The gap is checked at this stage with the ramp fully lowered. The gap must also be checked throughout the ramp operating range; this is carried out in Adjustment/ Test.

F. Conclusion

(1) Check, and adjust if necessary, the ramps rigging, clearances, backlash and seal clearances as detailed in Adjustment/Test.

(2) Carry out a ramps Functional Test as detailed in Adjustment/Test.

3. Rear Ramp (Ref. Fig. 402)

CAUTION: 'BEFORE SB 54-036' AND 'AFTER SB 54-036' REAR RAMPS MUST NOT BE MIXED ON AN AIRCRAFT, I.E., SB 54-036 MUST BE EMBODIED ON ALL INTAKES OR NONE.

A. Equipment and Materials

DESCRIPTION	PART NO.
Support block, for rear ramp	D925453001
Torque spanner, 12 to 14 lbf in (0.137 to 0.160 mdaN)	-
Torque spanner, 18 to 32 lbf in (0.203 to 0.362 mdaN)	-
Torque spanner, 20 to 25 lbf in (0.226 and 0.282 mdaN)	-
Torque spanner, 25 to 30 lbf in	-

DESCRIPTION	PART NO.
(0.282 to 0.339 mdaN)	
Torque spanner, 30 to 40 lbf in (0.339 to 0.452 mdaN)	-
Torque spanner, 50 to 60 lbf in (0.565 to 0.678 mdaN)	-
Torque spanner, 220 to 350 lbf in (2.486 to 3.955 mdaN)	-
Push-pull gauge, 0 to 70 lbf (0 to 311.376 N)	-

B. Prepare to Remove Rear Ramp

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

(1) Carry out the procedures detailed in paragraphs 2.B.(1) to (14).

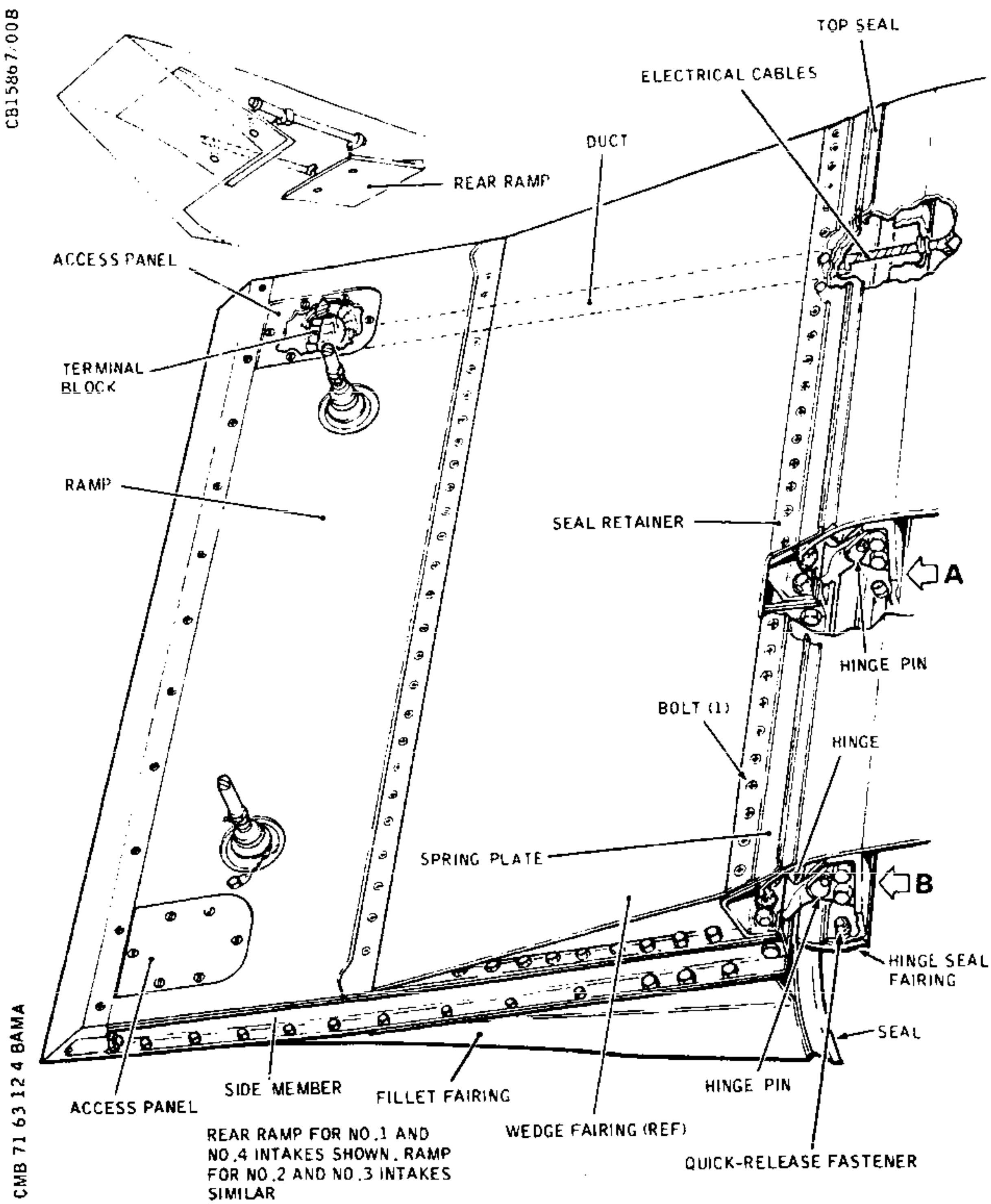
C. Remove Rear Ramp

CAUTION: ENSURE THAT THE RAMP, PARTICULARLY THE LEADING EDGE, WHICH HOUSES AN ELECTRICAL ELEMENT, IS NOT DAMAGED.

DURING REMOVAL DO NOT HANDLE THE RAMP BY ITS LINKS, OR PLACE THE RAMP, LINKS DOWNWARD, SO THAT WEIGHT IS TAKEN BY THE LINKS, OTHERWISE DAMAGE MAY BE CAUSED TO THE SPHERICAL BEARING HOUSING IN THE LINK LOWER EYE-END. REFER TO THE FOLLOWING NOTE.

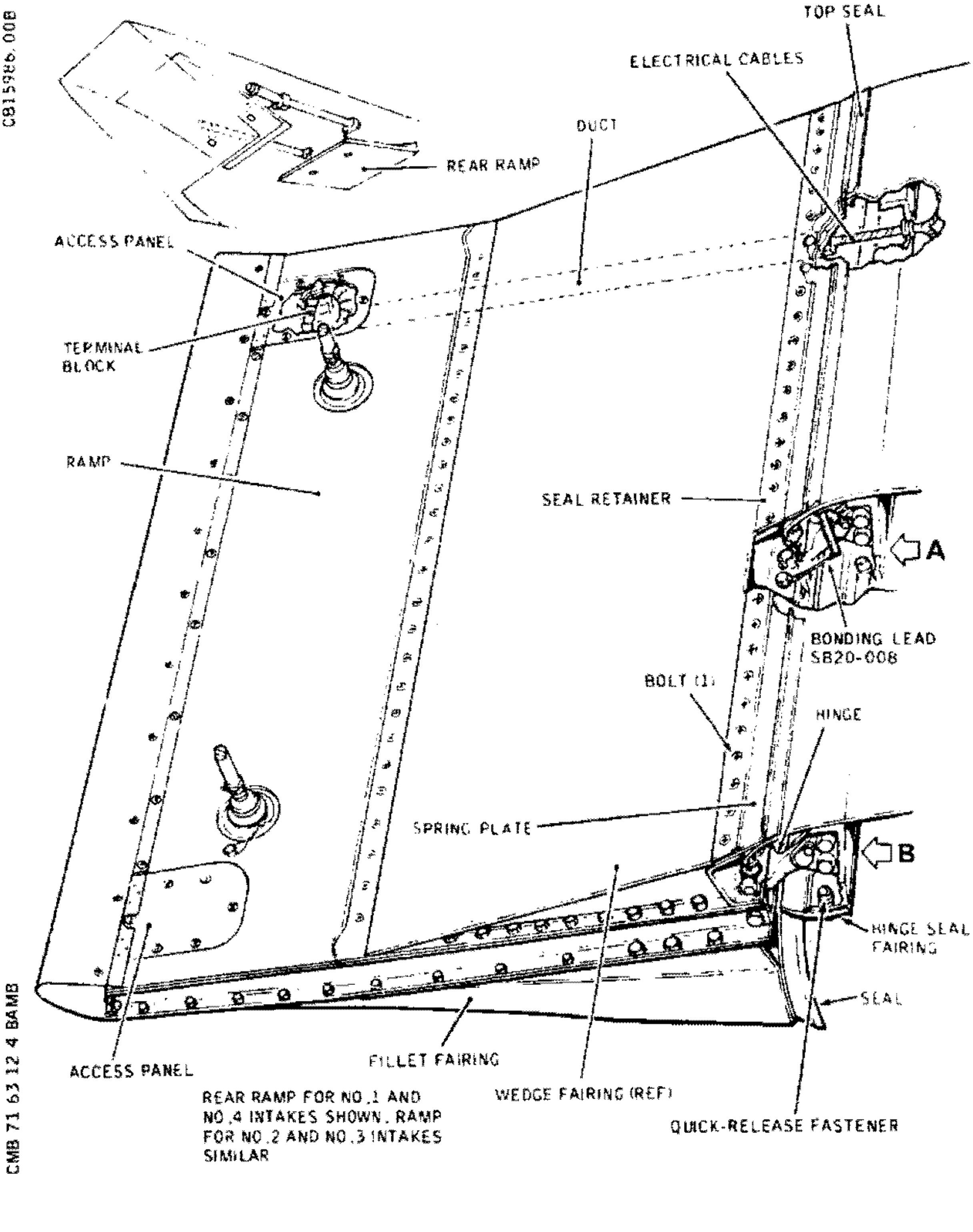
NOTE: With reference to the above CAUTION, possible damage consists of local peening of the spherical bearing housing in line with the axis of the spherical bearing link pin, caused by impact of the bearing housing on the link housing. Such damage will impair the movement of the ramp link on its spherical bearing and necessitate the renewal of the ramp link (or eye-end).

(1) Disconnect the electrical cables to the anti-icing



\- Rear Ramp - Installation (Sheet 1 of 4)
Before SB 54-036 and SB 20-008
Figure 402

R



\- Rear Ramp - Installation (Sheet 2 of 4)
After SB 54-036 and SB 20-008
Figure 402

R

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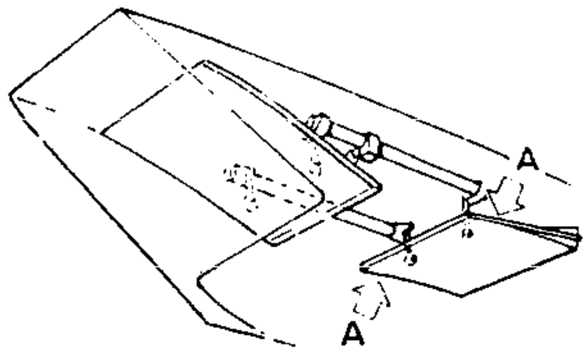

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R Rear Ramp - Installation - Dimension Z
R Figure 402 (Sheet 3 of 4)

heating elements in the rear ramp, as follows:-

(a) Remove the access panel on the side where the cables enter the ramp.

(b) Disconnect the cables from the terminal block; withdraw the cables from the ramp.

(2) Remove the hinge seal fairing, below the ramp hinges.

(3) Remove the split pins, nuts and washers from the bolts securing the links to the torque tube levers (Ref. Fig. 404). Support the leading edge of the ramp and remove the two bolts; lower the ramp onto the support block.

(4) Remove the bolts (1) securing the top seal to the wedge fairing. Disengage and remove the seal retainer, spring plate and the top seal.

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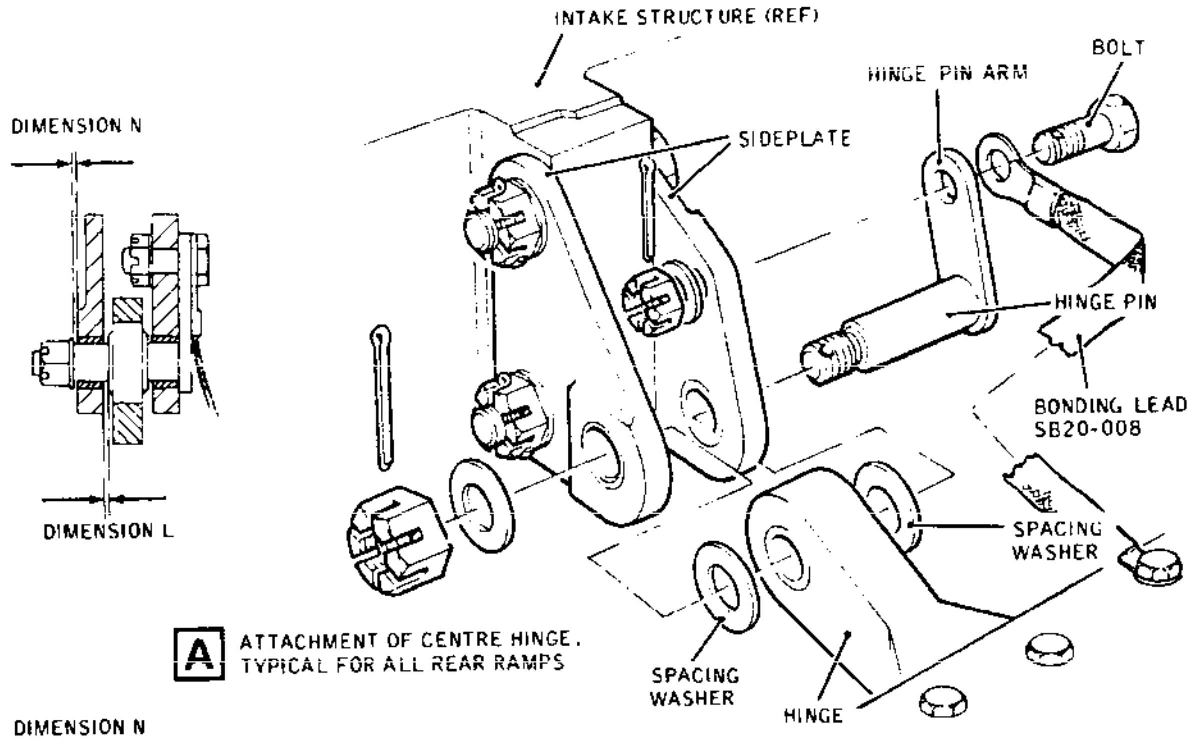
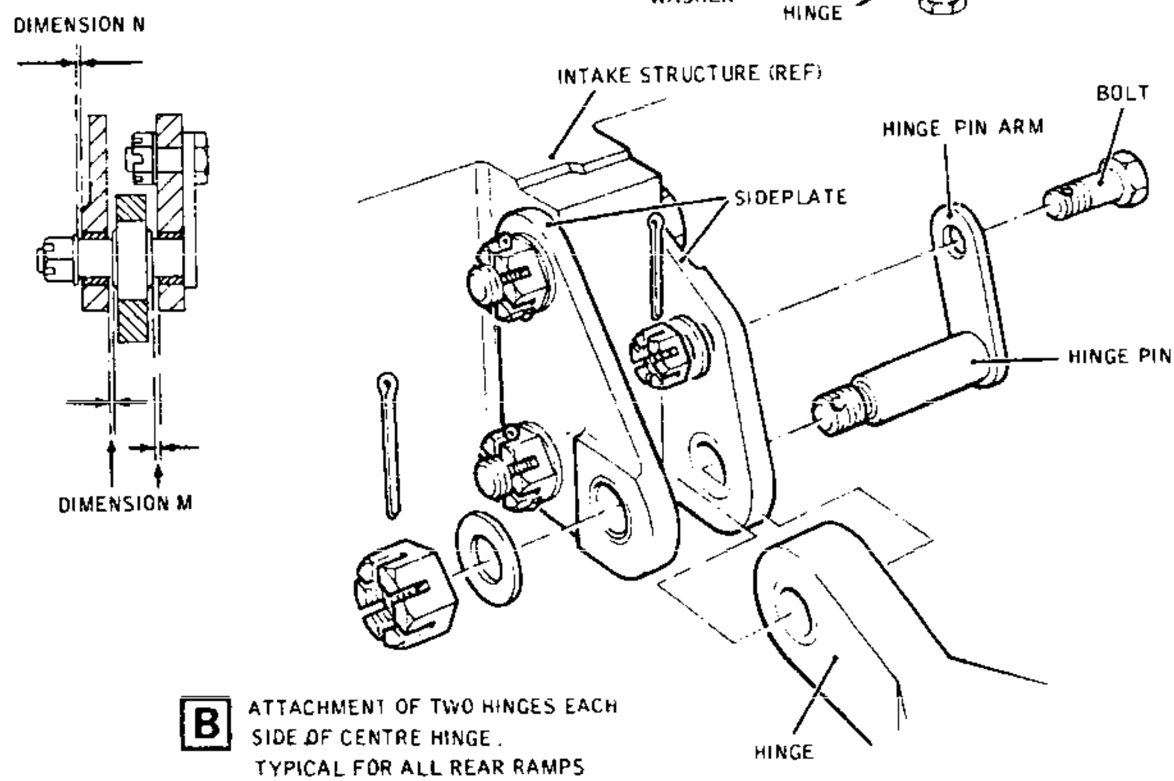


A ATTACHMENT OF CENTRE HINGE.
TYPICAL FOR ALL REAR RAMPS



B ATTACHMENT OF TWO HINGES EACH
SIDE OF CENTRE HINGE.
TYPICAL FOR ALL REAR RAMPS

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– Rear Ramp - Installation (Sheet 4 of 4)
Figure 402

R

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(5) Remove the four hinge pins (two each side of the centre hinge) as follows:-

(a) Remove the split pins, nuts and washers securing the hinge pin arms to the sideplates. Do not remove the bolts at this stage.

(b) Remove the split pins, washers and nuts securing the hinge pins.

(c) Remove the bolts from the hinge pin arms.

(d) Support the ramp; remove the four hinge pins.

Before SB 20-008

(6) At the centre hinge, proceed as follows:-

(a) Remove the split pin, nut and washer securing the arm of the hinge pin to the sideplate. Do not remove the bolt at this stage.

(b) Remove the split pin, washer and nut securing the hinge pin.

(c) Remove the bolt from the hinge pin arm.

(d) With the ramp supported, remove the hinge pin, spacing washers and, if fitted, spacer/shims; record the position from which the spacer/shims were removed.

After SB 20-008 For A/C 001-005,

(6) At the centre hinge, proceed as follows:-

(a) Remove the split pin, nut and washer securing the arm of the hinge pin and the bonding lead to the sideplate. Do not remove the bolt at this stage.

(b) Remove the split pin, nut and washer securing the hinge pin.

(c) Remove the bolt from the hinge pin arm and bonding lead.

(d) With the ramp supported, remove the hinge pin, spacing washers and, if fitted, spacer/shims;

record the position from which the spacer shims were removed.

(7) Disengage and remove the ramp from the intake and place it in a suitable stand.

(8) If required, remove each link from the rear ramp as detailed in paragraph 5.

D. Prepare to Install Rear Ramp

(1) If applicable, connect the links to the ramp as detailed in paragraph 5.

After SB 20-008 For A/C 001-005,

(2) Check that the bonding lead is serviceable.

RB (3) Before installing the rear ramp, visually inspect the
RB aluminium alloy hinge posts, located vertically
RB between the steel hinge sideplates, for scores and
RB dents. Repair as required to SRM 54-11-00.

E. Install Rear Ramp

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

CAUTION: DURING INSTALLATION DO NOT HANDLE THE RAMP BY ITS LINKS, OR PLACE THE RAMP, LINKS DOWNWARD, SO THAT WEIGHT IS TAKEN BY THE LINKS, OTHERWISE DAMAGE MAY BE CAUSED TO THE SPHERICAL BEARING HOUSING IN THE LINK LOWER EYE-END. REFER TO THE FOLLOWING NOTE.

NOTE: With reference to the above CAUTION, possible damage consists of local peening of the spherical bearing housing in line with the axis of the spherical bearing link pin, caused by impact of the bearing housing on the link housing. Such damage will impair the movement of the ramp link on its spherical bearing and necessitate the renewal of the ramp link (or eye-end).

(1) Ensure that the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.

(2) Install each of the four hinge pins (two each side of centre hinge) as follows:-

(a) Position the ramp and engage the hinges in the sideplates. Coat the hinge pins with Never-Seez

grease; using a suitable bullet, insert each hinge pin.

(b) Align the hole in the arm of each hinge pin with the hole in the associated sideplate; fit the bolt, washer and nut. Torque-tighten each nut to between 25 and 30 lbf in (0.282 and 0.339 mdaN). Fit split pins.

(c) Fit the washers and nuts to the hinge pins. Torque-tighten each nut to between 50 and 60 lbf in (0.565 and 0.678 mdaN). Fit split pins.

Before SB 20-008

(3) At the centre hinge, proceed as follows:-

(a) Insert the spacing washers and, if fitted, spacer/shims in the positions noted on removal. Coat the hinge pin with Never-Seez grease; using a suitable bullet, insert the hinge pin.

(b) Align the hole in the arm of the hinge pin with the hole in the sideplate; fit the bolt, washer and nut. Torque-tighten the nut to between 25 and 30 lbf in (0.282 and 0.339 mdaN); fit a split pin.

(c) Fit a washer and nut to the hinge pin. Torque-tighten the nut to between 50 and 60 lbf in (0.565 and 0.678 mdaN); fit a split pin.

After SB 20-008 For A/C 001-005,

(3) At the centre hinge, proceed as follows:-

(a) Insert the spacing washers and, if fitted, spacer/shims in the positions noted on removal. Coat the hinge pin with Never-Seez grease; using a suitable bullet, insert the hinge pin.

(b) Fit the bolt securing the hinge pin arm to the sideplate:

(b1) Align the hole in the arm with the hole in the sideplate.

(b2) Assemble the bonding lead under the head of the bolt (Ref. Fig.402, Sheet 4) and insert the bolt.

R (b3) Fit the washer and nut, and torque-tighten to between 25 and 30 lbf in (0.282 and
R 0.339 mdaN).

(b4) Fit a split pin, and encapsulate the nut with sealant in accordance with 20-22-19
R using PR1720SM.

(c) Fit the washer and nut to the hinge pin.
R Torque-tighten to between 50 and 60 lbf in (0.565
R and 0.678 mdaN); fit a split pin.

(4) Cover all hinge pivots with Never-Seez grease to form dust seals.

(5) Check that the following requirements are met (Ref. Fig. 402) (Sheets 3 and 4):

(a) The gap between the sideplate and the washer of each hinge pin must be 0.002 in (0.0508 mm) minimum (dimension N).

(b) The bearing of the centre hinge must have an end float between the sideplates of 0.001 in (0.0254 mm) minimum to 0.010 in (0.254 mm) maximum (dimension L).

(c) The gap between each side of the other four bearings and the associated sideplate must be 0.020 in (0.508 mm) minimum (dimension M).

(d) When the ramp is moved through its full operating range, a clearance, at each side of of the ramp, of 0.120 to 0.350 in (3.048 to 8.890 mm) (dimension Z) must exist between the edges of the rear ramp and fillet fairing, and the peaks of the undulations on the intake walls.

(6) Insert the electrical cables through the duct in the ramp. Do not connect the cables to the terminal block at this stage.

(7) Carefully raise and then lower the ramp. Check the ramp for free and smooth operation about the hinges.

(8) Suitably protect the leading edge of the ramp, approximately central, where the push-pull gauge will be applied.

NOTE: In operations (9) and (10) the push-pull gauge must be used at 90 deg to the ramp centre line, and must follow the arc of the ramp travel, approximately.

(9) Using the push-pull gauge, push the ramp fully up; check throughout the ramp movement that the force required does not exceed 70 lbf (311.376 N).

(10) Using the push-pull gauge, pull the ramp fully down; check throughout the ramp movement that the force required does not exceed 20 lbf (88.965 N).

(11) Remove the protective covering from the ramp leading edge.

(12) Position the top seal, spring plate and seal retainer on the ramp fairing and fit the bolts (1). Torque-tighten the bolts to between 20 and 25 lbf in (0.226 and 0.282 mdaN).

(13) Fill any gaps between the seal retainer and the rear ramp skin in accordance with 20-22-11.

(14) Raise the leading edge of the ramp and position the links in the torque tube levers (Ref. Fig. 404). Fit the bolts (with their heads, against the lugs), washers and nuts; torque-tighten the nuts to
R between 220 and 350 lbf in (2.486 and 3.955 mdaN).

CAUTION: IN OPERATION (15), THE SPLIT PIN LEGS MUST NOT BE BENT OVER THE END OF THE BOLTS.

(15) Fit a split pin to each nut; turn the legs in opposite directions around the nut and press the legs hard against the nut to prevent the split pin from turning. Encapsulate the head and legs of both split pins with sealant in accordance with 20-22-19,
R using PR1720SM.

(16) Connect the electrical cables to the terminal block, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(17) Torque-tighten the terminal nuts to between 12
R and 14 lbf in (0.136 and 0.158 mdaN) in accordance with 20-27-14. Fit the access panel.

(18) Fit the hinge seal fairing below the hinges, ensuring

that the seal is correctly positioned below the fairing.

F. Conclusion

(1) Check, and adjust if necessary, the ramps rigging, backlash and side fairing clearances as detailed in Adjustment/Test.

(2) Remove the safety clips and reset the following circuit breakers associated with the rear ramp de-icing system to be tested (Ref. para.2.B.(7)):

(a) LH CYCLIC TIMER CONT, or
RH CYCLIC TIMER CONT

(b) WING & INTS NORM CONT

(c) WINGS & INTS ALT CONT

(3) Carry out an Operational Test of the associated wing and intake cyclic de-icing system in accordance with 30-11-00, Adjustment/Test.

(4) Carry out a Functional Test of the ramps as detailed in Adjustment/Test.

4. Rear Ramp Leading Edge

WARNING: IF THE LEADING EDGE IS BEING REMOVED AND INSTALLED WHILST THE REAR RAMP IS IN POSITION ON THE AIRCRAFT, OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

CAUTION: A 'BEFORE SB 54-036' REAR RAMP LEADING EDGE MUST NOT BE FITTED TO AN 'AFTER SB 54-036' REAR RAMP, AND NEITHER MUST AN 'AFTER SB 54-036' REAR RAMP LEADING EDGE BE FITTED TO A 'BEFORE SB 54-036' REAR RAMP.

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner, 12 to 14 lbf in (0.137 to 0.160 mdaN)	-

DESCRIPTION	PART NO.
Torque spanner, 18 to 32 lbf in (0.203 to 0.362 mdaN)	-

B. Prepare to Remove Leading Edge

(1) Carry out the procedures detailed in paragraphs 2.B.(1) to (14).

NOTE: This instruction may be ignored if the rear ramp has been removed from the aircraft.

C. Remove Leading Edge (Ref. Fig. 403)

(1) Remove the terminal block access panels.

(2) Disconnect the electrical cables from both terminal blocks in the ramp.

(3) Remove, in accordance with 20-21-18, the countersunk-head bolts securing the leading edge to the ramp lower surface.

(4) Remove the countersunk-head nuts securing the leading edge to the ramp upper surface.

(5) Carefully disengage and remove the leading edge from the ramp, ensuring that the electrical cables are not damaged.

D. Install Leading Edge (Ref. Fig. 403)

WARNING: IF THE REAR RAMP IS INSTALLED ON THE AIRCRAFT, OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

(1) If applicable (ramp installed), ensure that the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.

(2) Ensuring that the electrical cables are correctly placed, position the leading edge on the ramp.

(3) Align the holes in the upper surface of the ramp and insert the countersunk-head nuts.

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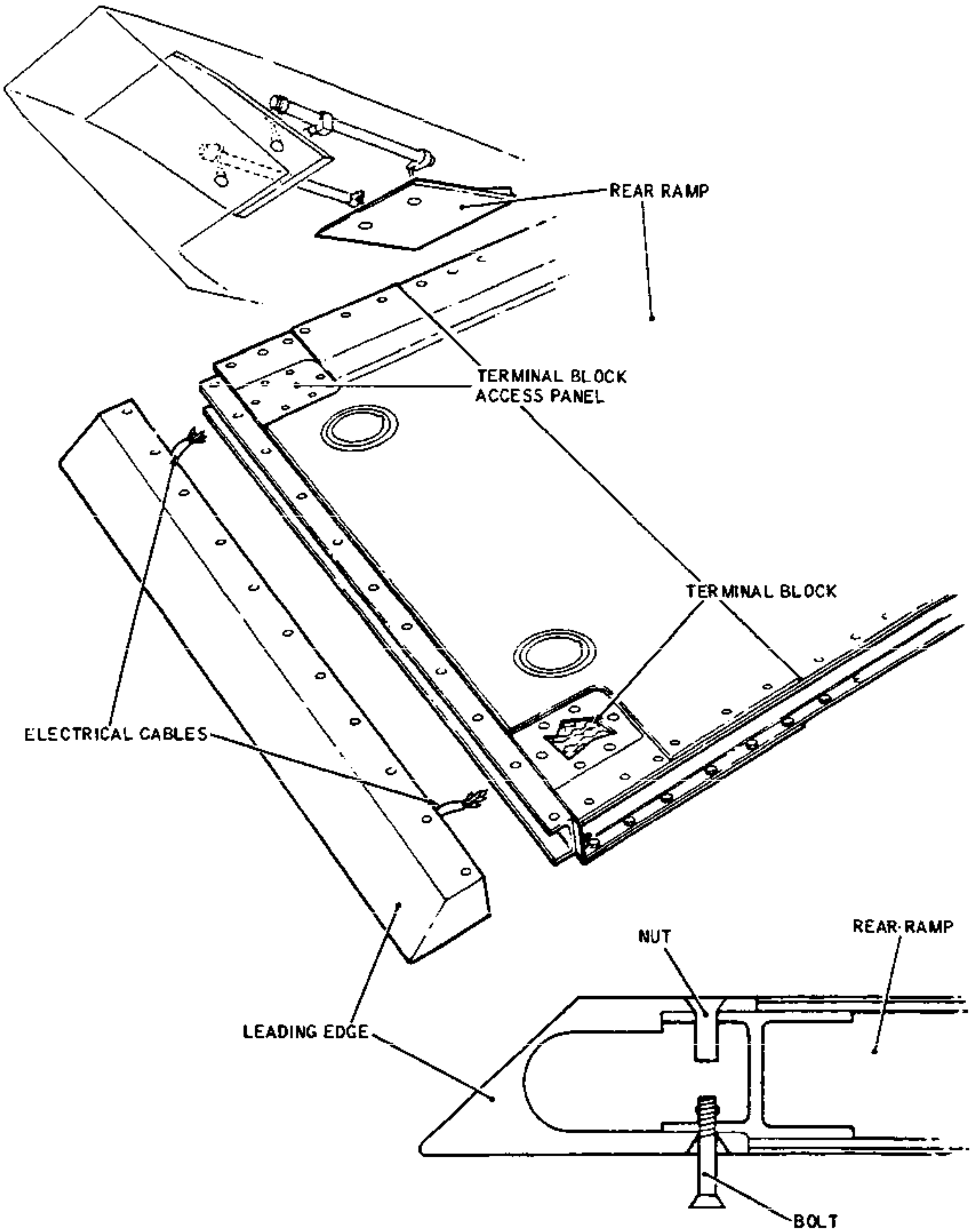

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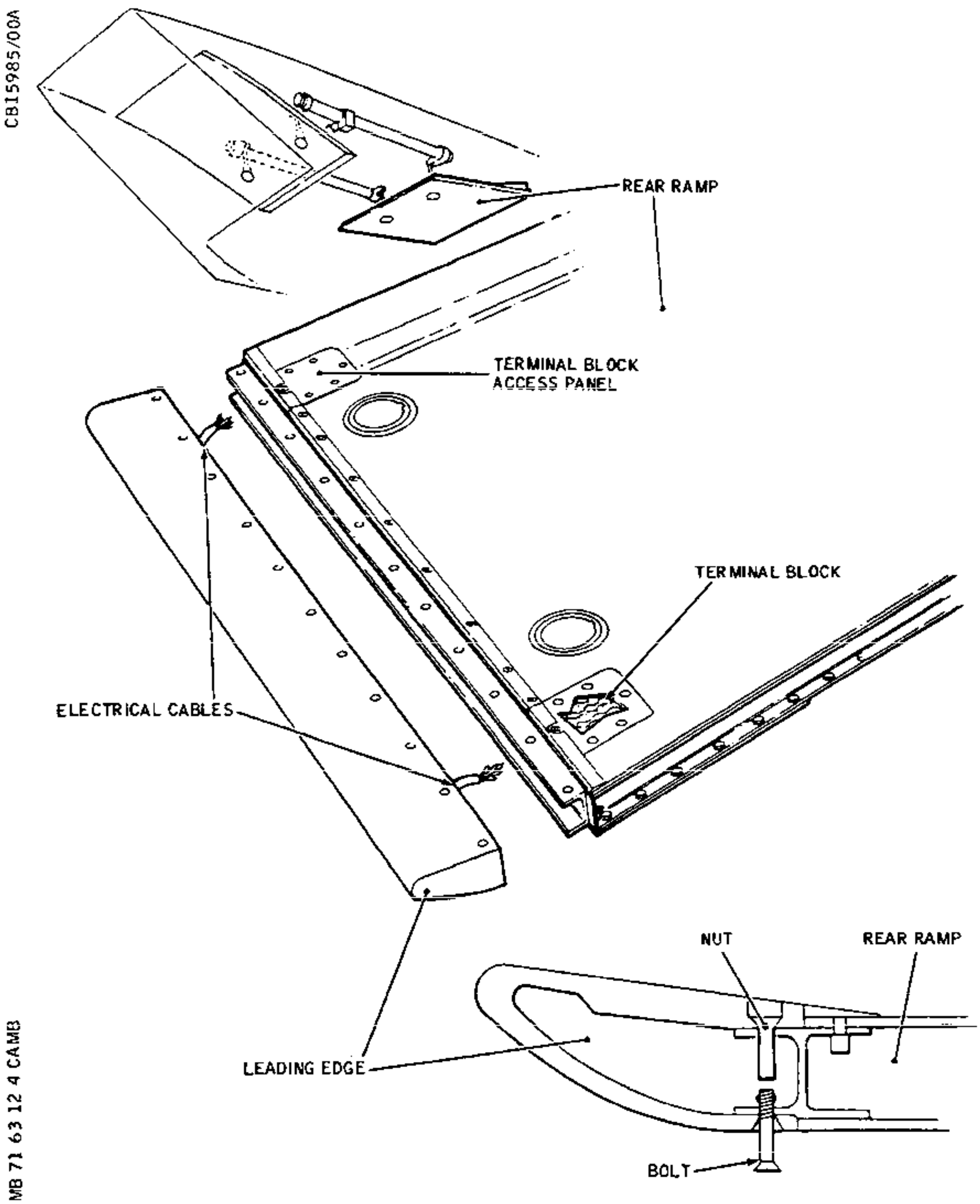
- Rear Ramp Leading Edge - Installation (Sheet 1 of 2)
Before SB 54-036
Figure 403



- Rear Ramp Leading Edge - Installation (Sheet 2 of 2)
After SB 54-036
Figure 403

(4) Fit the countersunk-head bolts to the nuts in accordance with 20-21-18.

(5) Torque-tighten the bolts to 25(±7) lbf in (0.282(±0.079) mdaN). Use the minimum amount of the tolerance to lock the bolts.

(6) Connect the electrical cables to the terminal blocks, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(7) Torque-tighten the terminal nuts to between 12 and 15 lbf in (0.137 and 0.169 mdaN) in accordance with 20-27-14.

(8) Fit the access panels to the ramp.

E. Conclusion

(1) If the leading edge has been installed on the ramp whilst it was in position on the aircraft, proceed as follows:-

NOTE: If the ramp is off the aircraft, these operations will be carried out after ramp installation.

(a) Remove the safety clips and reset the following circuit breakers associated with the rear ramp de-icing system to be tested (Ref. para.2.B.(7)):-

(a) LH CYCLIC TIMER CONT, or RH CYCLIC TIMER CONT

(b) WINGS & INTS NORM CONT

(c) WINGS & INTS ALT CONT

(b) Carry out an Operational Test of the wing and intake cyclic de-icing system in accordance with 30-11-00, Adjustment/Test.

CAUTION: IN OPERATION (c), AFTER REMOVAL OF TOOLS AND EQUIPMENT, THOROUGHLY CHECK THE INTAKE INTERIOR FOR DEBRIS AND LOOSE OBJECTS.

(c) Remove all tools and equipment from the intake and ensure that the intake interior is clean.

(d) Remove the locking pins from the hydraulic selector valves of the four intakes.

(e) On the intake management panel, proceed as follows:-

e1) Remove the anti-inteference plate.

e2) Set all HYD switches to "AUTO".

e3) Set the four RAMP/SPILL MASTER switches to "MAN".

(f) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(g) Remove the placard from the engine start panel.

(h) Remove the barriers from the intake entries and from beneath the spill doors.

5. Links

WARNING: IF THE LINKS ARE BEING REMOVED AND INSTALLED WHILST THE RAMP IS IN POSITION ON THE AIRCRAFT, OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

A. Equipment and Materials

	DESCRIPTION	PART NO.
	Support block, for front ramp	E925453000
	Support block, for rear ramp	E925453001
R	Non-metallic spatula	-
R	Torque spanner, 220 to 350 lbf in (2.49 to 3.96 mdaN)	-
R R	Torque spanner 31-40 lbf in (0.35 - 0.45 mdaN)	
	Torque spanner, 1,400 to 1,500 lbf in (15.82 to 16.95 mdaN)	-

DESCRIPTION	PART NO.
Adapter	D925088001
Setting piece	D925089000
Special spanner	D925419100
R Sealant, PR1720SM(20-30-00, No.351) R	-
Locking wire, 0.031 in (0.8 mm) R	DTD 189

B. Prepare to Remove Links

NOTE: These instructions may be ignored if the ramp has been removed from the aircraft.

(1) Carry out the procedures detailed in paragraphs 2.B.(1) to (14).

(2) Disconnect the links from the associated torque tube levers as follows:-

(a) Remove the split pin, nut and washer from the bolt securing each link to the associated torque tube lever.

(b) Support the ramp and remove the two bolts; lower the ramp on to the appropriate support block.

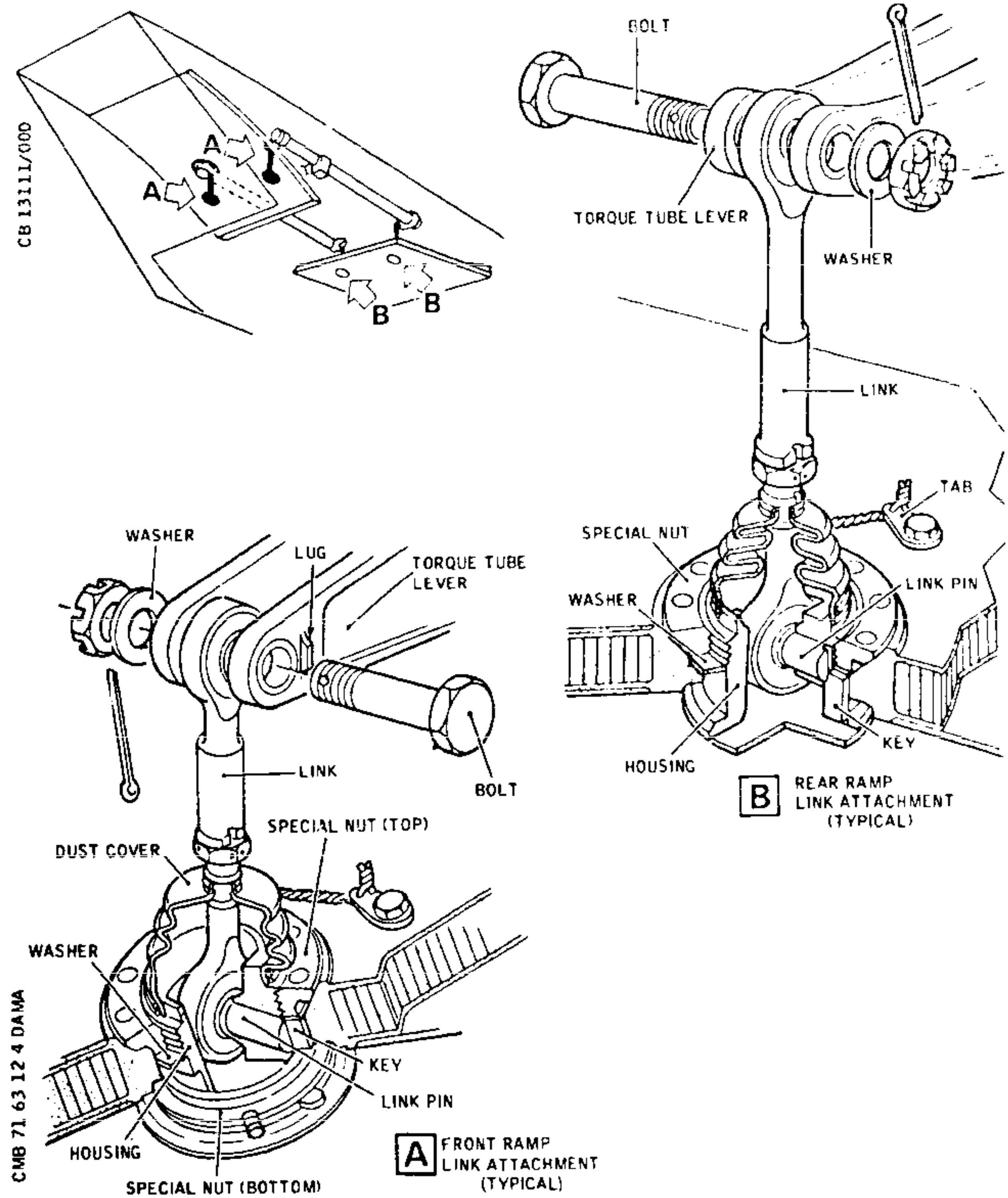
R C. Remove Links (Ref. Fig. 404)

(1) Remove a front ramp link, as follows:-

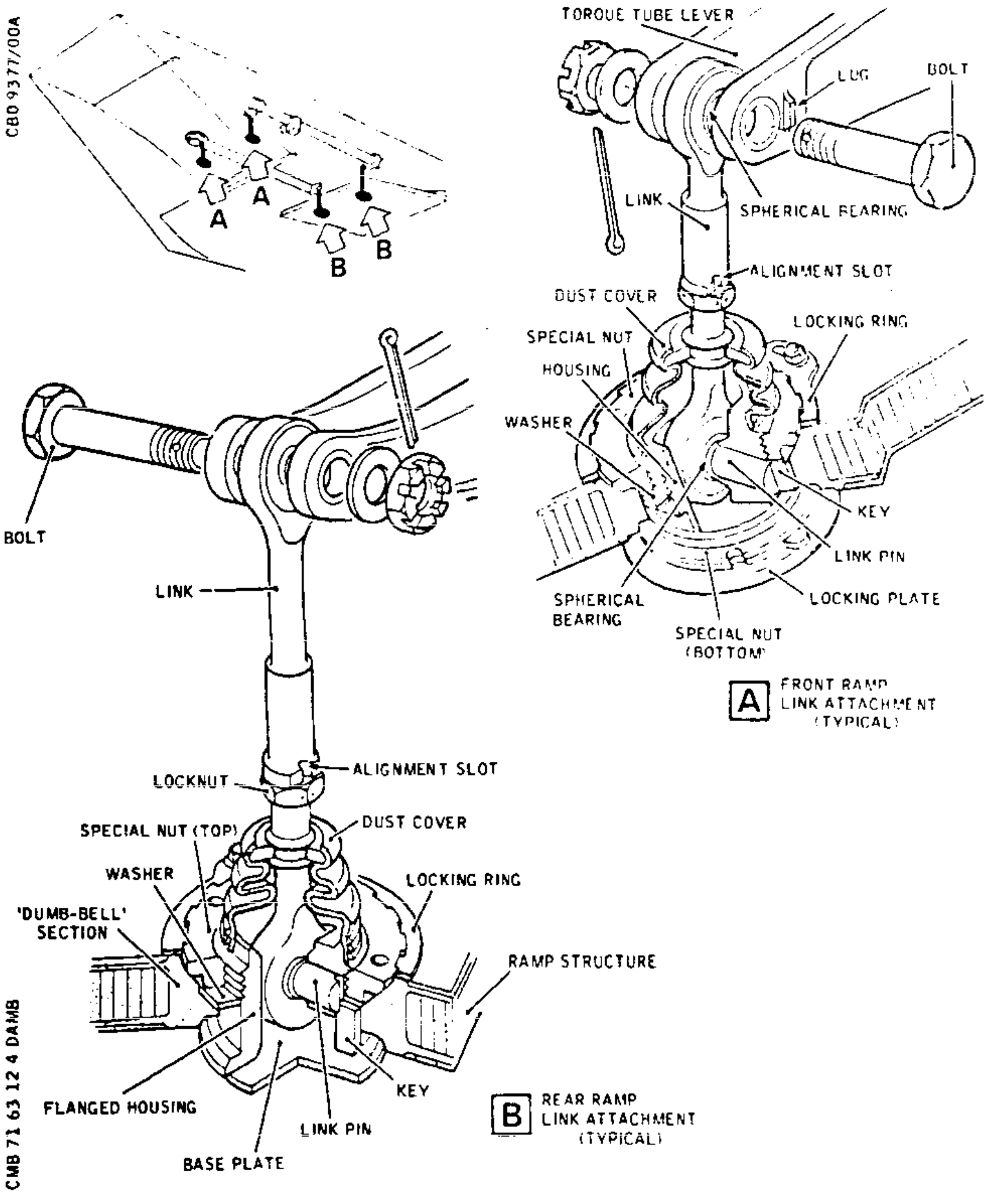
CAUTION: DO NOT LOOSEN THE LINK LOCKNUT AND THUS AVOID ALTERING THE LENGTH OF THE LINK.

R (a) Remove the sealant from the holes in the
R special nut (bottom) locking plate.

R (b) Remove the locking wire from the special nut



Links - Installation (Sheet 1 of 2)
Before SB 71-029 and SB 71-068
Figure 404



Links - Installation (Sheet 2 of 2)
After SB 71-029 and SB 71-068
Figure 404

R

EFFECTIVITY: ALL

BA

(top) and from the locking tab. Recover all locking wire.

R Before SB 71-068 For A/C 001-006,

(b) Remove the nuts and bolts securing the locking ring to the 'dumb-bell' section and withdraw the locking ring.

(c) Hold the special nut (bottom) with the special spanner and using the adapter, remove the special nut (top) and washer.

(d) Remove the housing, complete with the link, dust cover, link pin, key and special nut (bottom) from the ramp. Retain the key.

(e) Identify the link with the position from which it was removed.

(2) Remove a rear ramp link, as follows:-

CAUTION: DO NOT LOOSEN THE LINK LOCKNUT AND THUS AVOID ALTERING THE LENGTH OF THE LINK.

(a) Remove the locking wire from the special nut and from the locking tab. Recover all the locking wire.

After SB 71-068 For A/C 001- 006,

(a) Remove the nuts and bolts securing the locking ring to the 'dumb-bell' section and withdraw the locking ring.

(b) Using the adapter, remove the special nut and washer.

(c) Remove the housing, complete with the link, link pin, key and dust cover from the ramp. Retain the key.

(d) Identify the link with the position from which it was removed.

R D. Install Links (Ref. Fig. 404)

WARNING: IF THE RAMPS ARE INSTALLED ON THE AIRCRAFT, OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

(1) If applicable (ramps installed), ensure that the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.

(2) Install a front ramp link, as follows:-

(a) Fit the link to the housing with the link pin, positioning the flat of the link pin at the bottom.

(b) Using the special spanner, fit the special nut (bottom) to the housing, bottoming the nut against the housing.

(c) Insert the housing, complete with the link, link pin, dust cover and special nut (bottom) into the ramp, aligning the key slot and the locking tabs on the special nut with the appropriate slots in the ramp.

NOTE: If necessary, the special nut (bottom) may be unscrewed, not more than one half-turn, to allow the locking tabs and the tab slots to become aligned.

(d) Fit the key, through the top surface of the ramp.

R (e) Set the torque spanner to between 1,400 and
R 1,500 lbf in (15.82 and 16.95 mdaN) using
R the setting piece.

R (f) Fit the washer and special nut (top) to the
R housing: torque-tighten the speical nut (top)
R to between 1,400 and 1,500 lbf in (15.82 and
R 16.95 mdaN) using the adapter.

R (g) Wire-lock the nut to the tab in accordance
R with 20-21-13.

R NOTE: Mod.2188, if embodied provides an
R additional tab for duplicate locking
R of the special nut.

R Before SB 71-068 For A/C 001-006,

(g) Wet assemble the locking ring to the 'dumb-bell' section (Ref.20-22-12) and secure it with bolts and nuts. Torque-tighten each nut to between 31 and 40 lbf in (0.35 and 0.45 mdaN). Encapsulate the nuts with Viton sealant PR1720SM (Ref.20-22-19).

(h) Seal the holes in the special nut (bottom) with silicone sealant in accordance with 20-22-13.

(3) Install a rear ramp link, as follows:-

(a) Insert the housing, complete with the link, link pin, key and dust cover, into the ramp.

(b) Set the torque spanner to between 1,400 and 1,500 lbf in (15.82 and 16.95 mdaN) using the setting piece.

(c) Fit the washer and special nut to the housing: torque-tighten the special nut to between 1,400 and 1,500 lbf in (15.82 and 16.95 mdaN) using the adapter.

(d) Wire-lock the nut to the tab in accordance with 20-21-13.

NOTE: Mod.2188, if embodied, provides an additional tab for duplicate locking of the special nut.

After SB 71-068 For A/C 001-006,

(d) Wet assemble the locking ring to the 'dumb-bell' section (Ref.20-22-12) and secure it with bolts and nuts. Torque-tighten each nut to between 31 and 40 lbf in (0.35 and 0.45 mdaN). Encapsulate the nuts with Viton sealant PR1720SM (Ref.20-22-19).

E. Conclusion

NOTE: If the links have been installed in the ramp whilst it was in position on the aircraft,

carry out operations (1) to (3). If the ramp is off the aircraft, these operations will be carried out after ramp installation.

CAUTION: THE SPLIT PIN LEGS MUST NOT BE BENT OVER THE END OF THE BOLT.

(1) Raise the ramp and position the links in the torque tube levers (Ref. Fig. 404). Fit the bolts, washers and nuts; torque-tighten the nuts to between 220 and 350 lbf in (2.49 and 3.96 mdaN). Fit split pins and encapsulate heads and legs with Viton sealant PR1720SM (Ref.20-22-19).

(2) Check, and adjust if necessary, in accordance with Adjustment/Test, the following:-

(a) Ramps rigging.

(b) Backlash.

(c) Seal clearances (front ramp only).

(d) Side fairing clearances (rear ramp only).

(3) Carry out a Functional Test of the ramps as detailed in Adjustment/Test.

6. Front Ramp Links - Emergency Removal

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

NOTE: This method of removing the front ramp links must be used only when it is impossible to disconnect the links from the torque tube levers normally (Ref. para.5.), for instance, if the actuator fails with the front ramp fully raised.

A. Equipment and Materials

DESCRIPTION	PART NO.
Support block, for front ramp	D925453000
Special spanner	D925419100
Rivets	NSA8814-32-00

B. Prepare to Remove Links

(1) Carry out the procedures detailed in paragraphs 2.B.(1) to (11) and (14).

C. Remove Links (Ref. Fig. 405)

(1) Remove the sealant from the holes in the special nut (bottom) of each link. Remove the locking wire from the special nut (top) and the locking tab of each link. Recover all the locking wire.

R Before SB 71-068 For A/C 001-006,

(1) Remove the sealant from the holes in the special nut (bottom) of each link.

(2) Suitably mark the locking plate, so that the plate can be correctly positioned on the nut for subsequent re-riveting.

(3) Locate the countersunk heads of the rivets securing the locking plate to the special nut (bottom) of both links.

(4) Carefully remove the rivets, using a drill, from both locking plates; remove the plates. Identify each plate with its associated link and special nut (bottom).

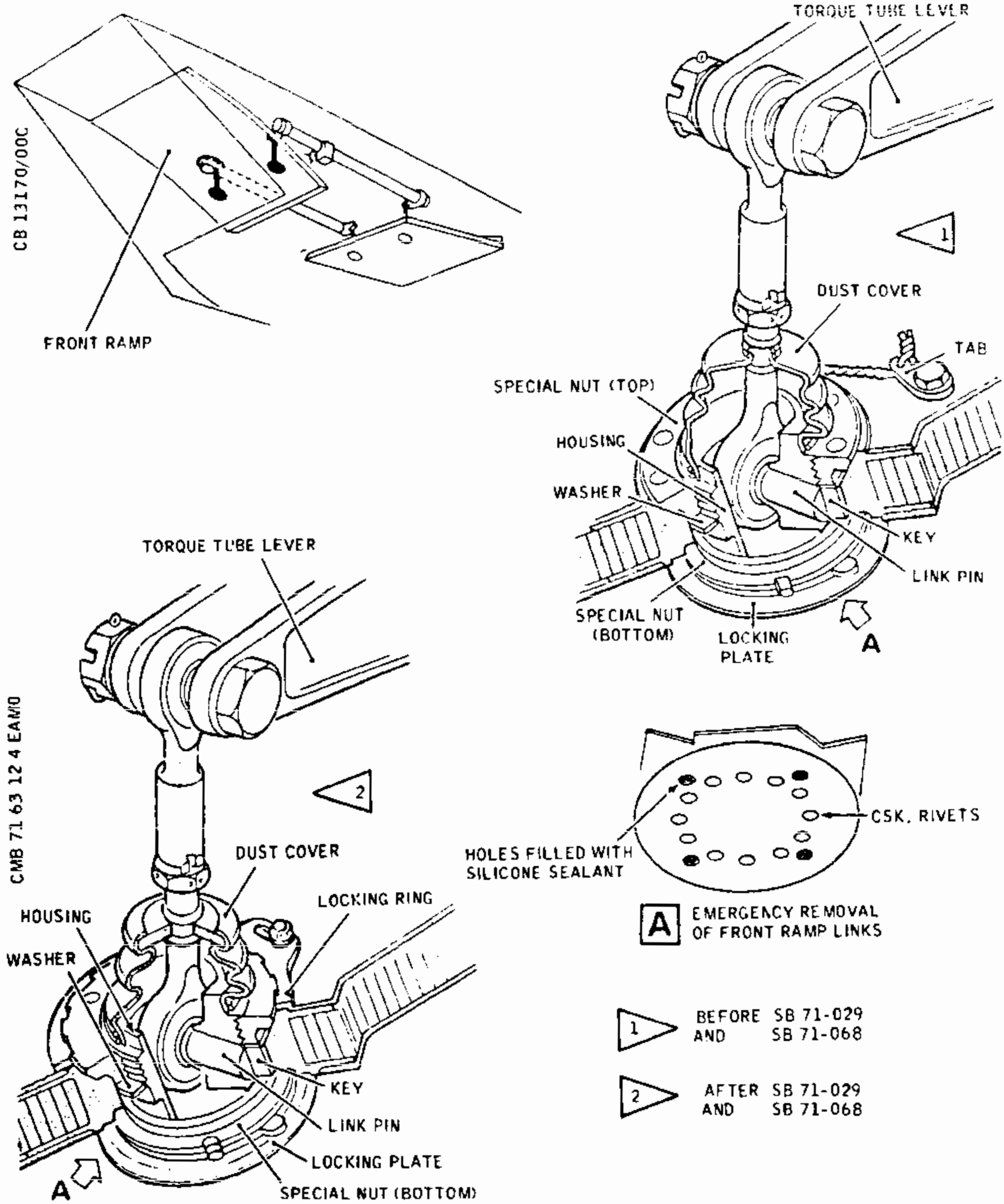
(5) Support the ramp; using the special spanner, remove each special nut (bottom) in turn.

(6) Ease the ramp free from the housings. Collect the keys, and the washers from beneath the special nuts (top), leaving the links, complete with housings, special nuts (top) and dust covers, suspended from the torque tube levers.

(7) Rest the trailing edge of the ramp on the support block.

(8) Disconnect the links from the torque tube levers (Ref. Fig. 404), as follows:-

(a) Remove the split pins, nuts and washers from the bolts securing each link to the torque tube levers.



\- Front Ramp Links - Emergency Removal
R Figure 405

(b) Support the links, remove the securing bolts and withdraw the links.

R After SB 71-068 For A/C 001-006,

(9) Remove the nuts and bolts securing the special nut (top) locking rings to the 'dumb-bell' section of the ramp, and remove both locking rings.

D. Prepare to Install Links

NOTE: Re-riveting the removed special nut and locking plate is conditional upon freedom from excessively oversize, elongated or otherwise damaged rivet holes.

If any rivet hole is unacceptable, a serviceable nut and plate assembly must be used; in such circumstances the following instructions do not apply.

(1) Position each locking plate, dry, on its special nut, aligning the marks previously made.

(2) Secure each locking plate and nut with rivets in accordance with 20-26-12.

E. Install Links

(1) When required, install the front ramp links as detailed in paragraphs 5.D and E.

RAMPS - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

R IN ADDITION, IT MUST BE ENSURED THAT HYDRAULIC POWER
R IS NOT APPLIED TO THE APPROPRIATE MAIN (GREEN OR BLUE)
R SYSTEM AND THE STANDBY (YELLOW) SYSTEM.

1. General

Once the ramps have been rigged during aircraft build, the setting is permanent. However, if any part of the ramps system is disturbed, rigging, adjustment (if necessary) and a Functional Test must be carried out.

The necessary procedures are included in this topic under the following headings:-

Ramps Rigging (includes backlash and clearance checks, and adjustment)

Functional Test

System and Operational Tests are not applicable in this instance.

The procedures apply to all intakes, differing only where stated.

2. Ramps Rigging (Ref. Fig. 501, 502 and 503)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Protective cover, for intake lip	D926806000
Servicing extension (springboard)	-
Work stand	-
Crawling board	-
Cover, for engine transition ring	D935036001
Brake release tool	E925089000
Ramp actuator gauge (mid-stroke setting)	E925053000
Dial test indicator	-
Torque spanner, 220 to 350 lbf in (2.486 to 3.955 mdaN)	-
Torque spanner, 280 to 300 lbf in (3.164 to 3.390 mdaN)	-
Torque spanner, 340 to 360 lbf in (3.842 to 4.068 mdaN)	-
Torque spanner, 133 to 177 lbf in (1.503 to 2.000 mdaN)	-
Modelling clay (Plasticine, or similar)	-
Locking wire	-

	DESCRIPTION	PART NO.
R	Before SB 54-036	
R R	Tooling button (qty. 4), for front and rear ramp rigging	E925165000
R	After SB 54-036 For A/C 001-005,	
R R	Tooling button (qty. 2), for front ramp rigging	E925165000
R R	Tooling button (qty. 2), for rear ramp rigging.	E925216000

B. Prepare to Rig Ramps

(1) De-fuel the aircraft as detailed in 28-25-00, Servicing, using the pumps.

NOTE: It is not necessary to drain the residual fuel.

(2) Ensure that the four intakes are clear of personnel and equipment. Position barriers to prevent persons from inadvertently entering the areas below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out inside the intakes.

(4) On the intake management panel, proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins to the spill door hydraulic selector valves of the four intakes (Ref. 71-62-00, Servicing).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

(8) Fit, and secure, the protective cover to the intake lip.

(9) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(10) Place the crawling board on the floor of the intake, aft of the servicing extension.

(11) Fit the cover to the engine transition ring.

(12) To enable the ramps to be moved manually,

release the actuator brake as follows:-

(a) Remove the plug from the brake unit.

(b) Using the brake release tool, as detailed on the instruction label, disengage the brake.

C. Rig Ramps

(1) Rotate, manually, the actuator screwjack bodies until the ramps are sufficiently above the mid-stroke position to enable the tooling buttons to be fitted to the rigging adapter plates on the intake walls.

CAUTION: THE TOOLING BUTTONS ARE MADE OF NYLON. THEREFORE, ENSURE THAT THE THREADS ARE CORRECTLY ENGAGED BEFORE TIGHTENING, AND DO NOT OVERTIGHTEN.

(2) Fit the tooling buttons, one each side for the front ramp and one each side for the rear ramp.

CAUTION: WHEN LOWERING THE RAMPS, ENSURE THAT THEY DO NOT CONTACT THE TOOLING BUTTONS BEFORE THE ACTUATOR GAUGE CAN BE INSERTED.

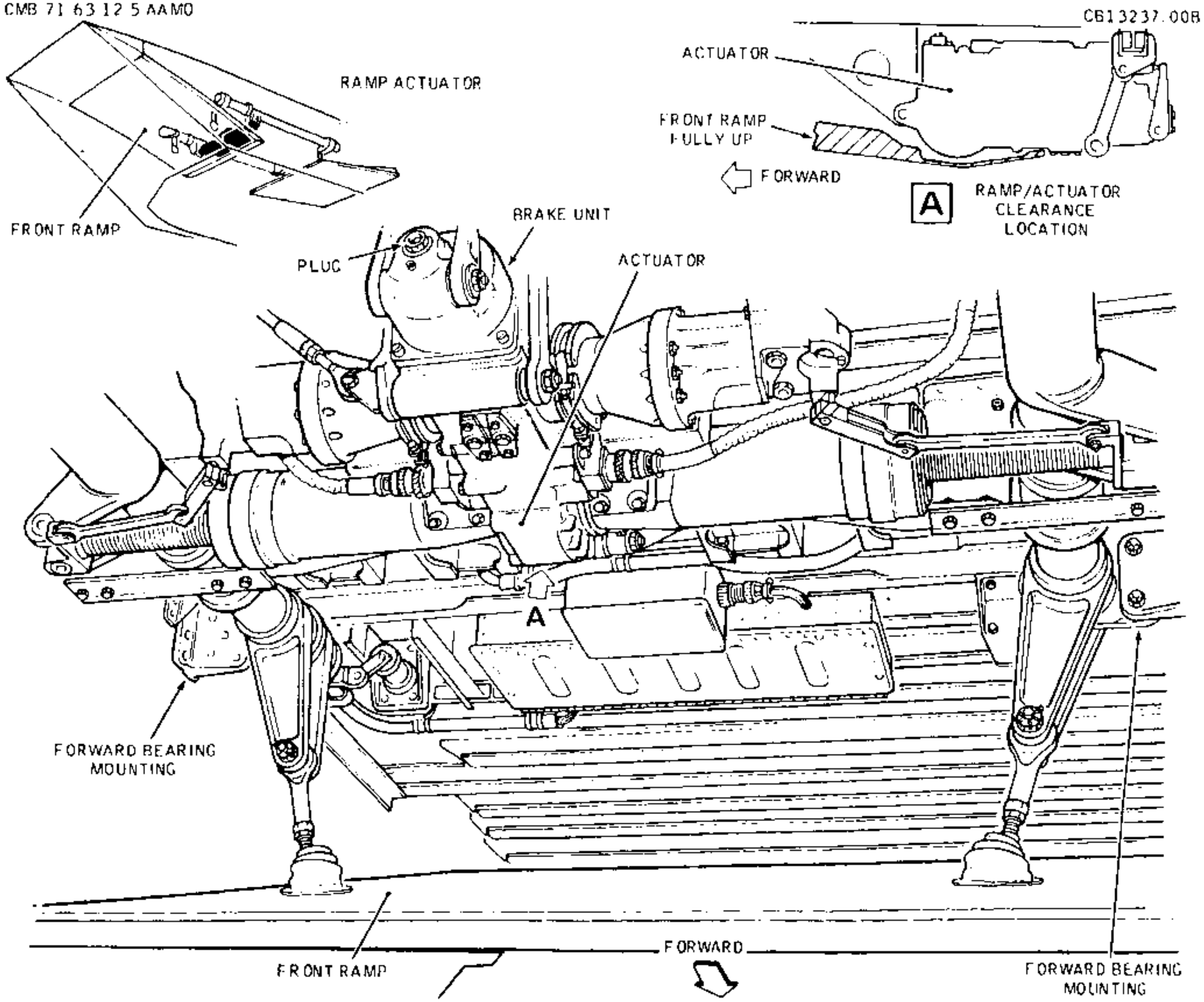
(3) Rotate, manually, the screwjack bodies to lower the ramps until the ramp actuator gauge can just be inserted over the screwjack threads between one screwjack body and the face of its associated trunnion.

(4) Using just enough force to take up any backlash, push the rear ramp upward and the front ramp downward.

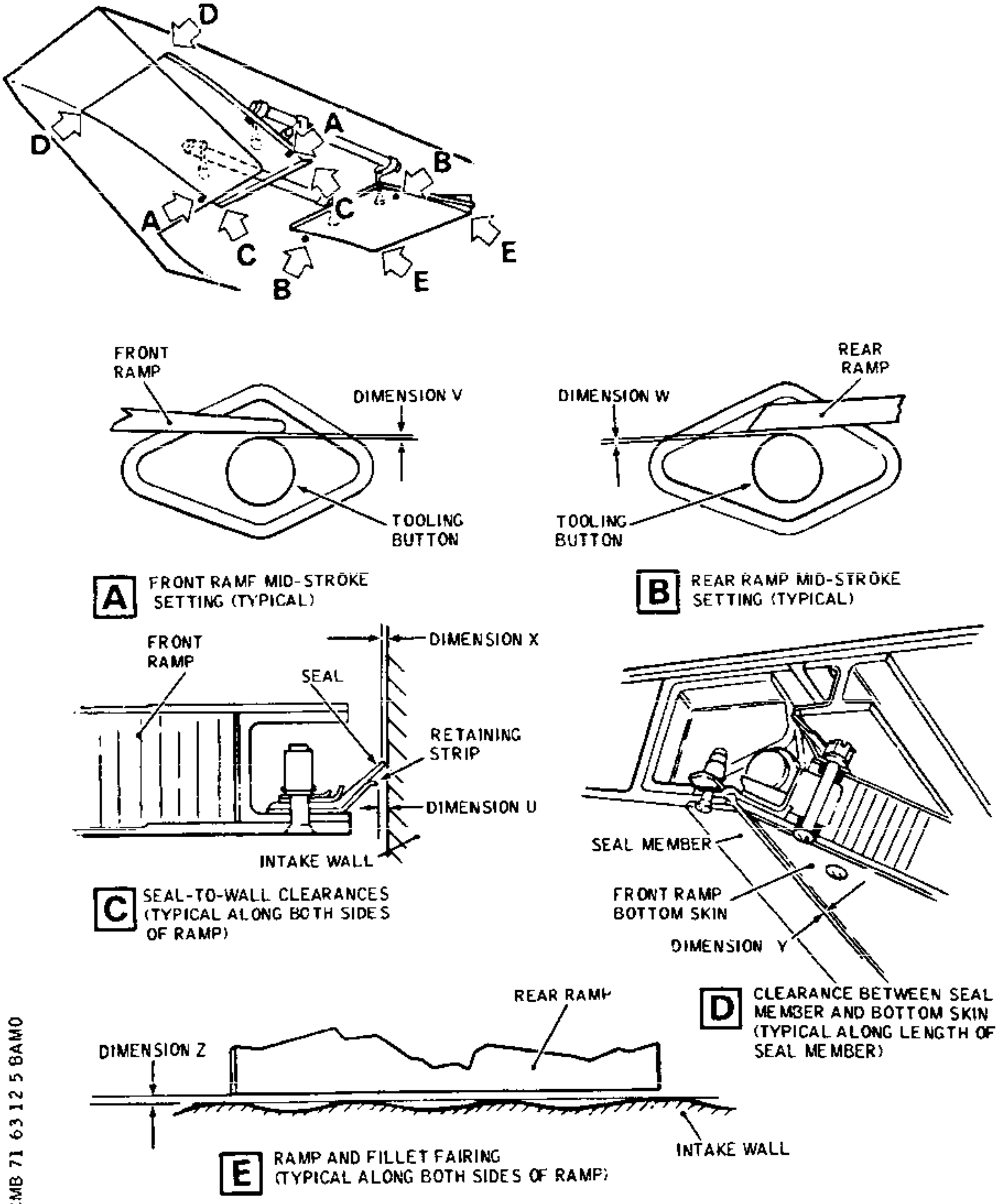
NOTE: This procedure must be carried out before a clearance between a ramp and tooling button is checked.

CAUTION: IF TABLE 501 IS USED IN OPERATION (5), IT IS ESSENTIAL TO DETERMINE THE INTAKE SERIAL NUMBER AND TO USE THE DIMENSIONS FOR THAT PARTICULAR INTAKE.

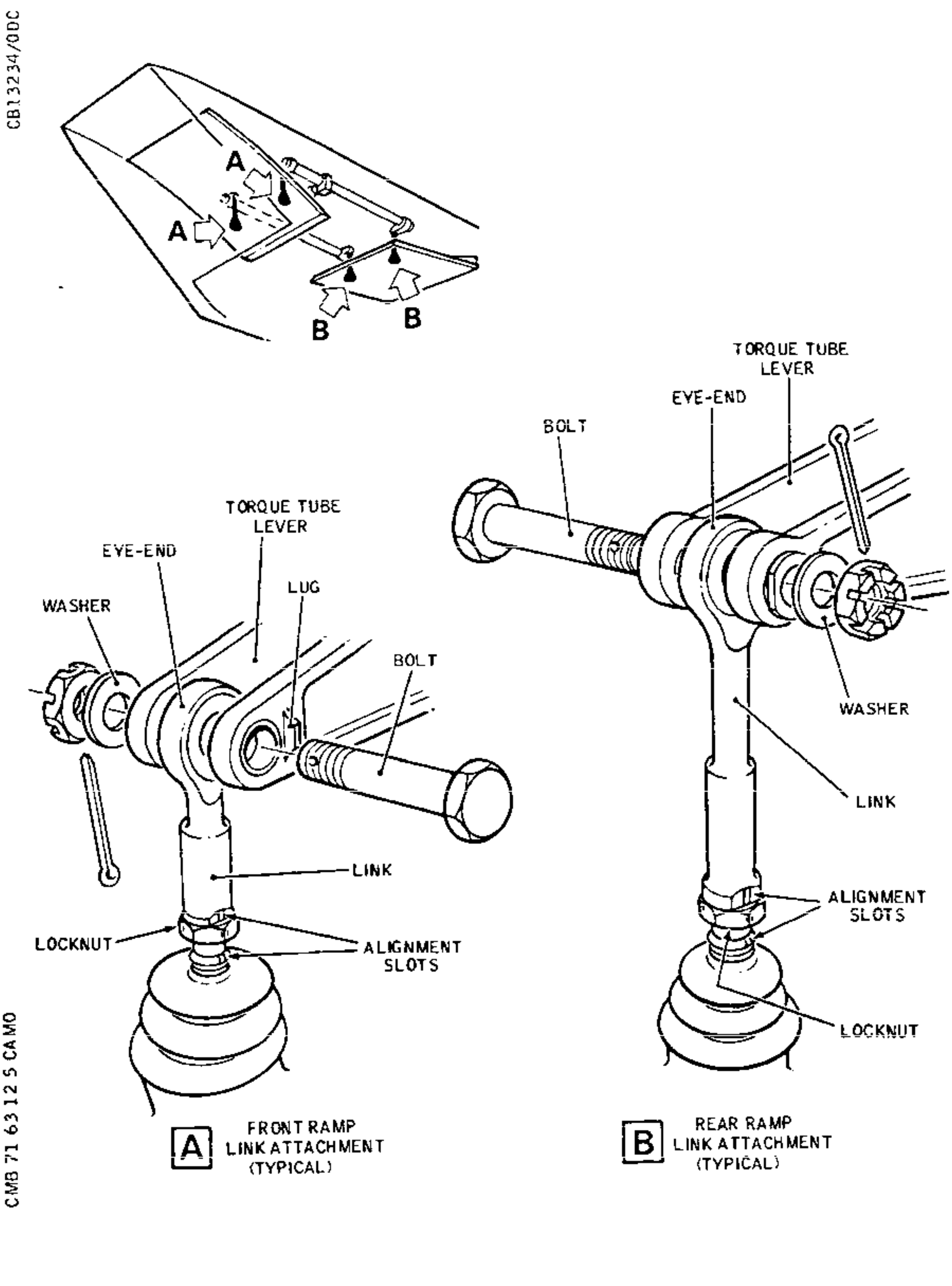
(5) Check that a clearance (Detail A, dimension V, and Detail B, dimension W) (Ref. Fig. 502) exists between the top of each tooling button and the associated bottom skin of each ramp, either by reference to -



Front Ramp to Actuator and
Structure Clearances
Figure 501



Rigging and Clearance References
Figure 502



R

Links - Adjustment
Figure 503

(a) the rigging adapter plate at each tooling button position, or by reference to -

(b) Table 501, ensuring that the dimensions used are those listed against the intake serial number.

NOTE: All dimensions have a tolerance of ±0.030 in (±0.762 mm).

The intake serial number plate is on the rear face of the fireproof bulkhead near the bottom skin of the LH intake.

INTAKE SERIAL NO.	ENGINE NO.	RAMP	CLEARANCE SIDEWALL inches (millimetres)	CLEARANCE CENTRE WALL inches (millimetres)
P204.E56.4000.000	1	FRONT	0.163 (4.140)	0.168 (4.267)
		REAR	0.185 (4.699)	0.206 (5.232)
	2	FRONT	0.112 (2.844)	0.157 (3.987)
		REAR	0.143 (3.632)	0.205 (5.207)
P204.E56.4000.001	3	FRONT	0.145 (3.683)	0.181 (4.597)
		REAR	0.178 (4.521)	0.206 (5.232)

INTAKE SERIAL NO.	ENGINE NO.	RAMP	CLEARANCE SIDEWALL inches (millimetres)	CLEARANCE CENTRE WALL inches (millimetres)
	4	FRONT	0.145 (3.683)	0.170 (4.318)
		REAR	0.172 (4.368)	0.206 (5.232)
P206.E56.4000.000	1	FRONT	0.174 (4.419)	0.140 (3.556)
		REAR	0.181 (4.597)	0.161 (4.089)
	2	FRONT	0.083 (2.108)	0.150 (3.810)
		REAR	0.104 (2.641)	0.191 (4.851)
P206.E56.4000.001	3	FRONT	0.185 (4.699)	0.167 (4.241)
		REAR	0.213 (5.410)	0.202 (5.130)
	4	FRONT	0.145 (3.683)	0.156 (3.962)

INTAKE SERIAL NO.	ENGINE NO.	RAMP	CLEARANCE SIDEWALL inches (millimetres)	CLEARANCE CENTRE WALL inches (millimetres)
		REAR	0.171 (4.343)	0.187 (4.749)
P208.E56.4000.000	1	FRONT	0.140 (3.556)	0.165 (4.191)
		REAR	0.162 (4.114)	0.178 (4.521)
	2	FRONT	0.123 (3.124)	0.172 (4.368)
		REAR	0.129 (3.276)	0.193 (4.902)
P208.E56.4000.001	3	FRONT	0.131 (3.327)	0.178 (4.521)
		REAR	0.132 (3.352)	0.191 (4.851)
	4	FRONT	0.156 (3.962)	0.168 (4.267)
		REAR	0.167 (4.241)	0.177 (4.495)

INTAKE SERIAL NO.	ENGINE NO.	RAMP	CLEARANCE SIDEWALL inches (millimetres)	CLEARANCE CENTRE WALL inches (millimetres)
P210.E56.4000.000	1	FRONT	0.141 (3.581)	0.140 (3.556)
		REAR	0.160 (4.064)	0.164 (4.165)
	2	FRONT	0.112 (2.844)	0.142 (3.606)
		REAR	0.137 (3.479)	0.166 (4.216)
P210.E56.4000.001	3	FRONT	0.146 (3.708)	0.171 (4.343)
		REAR	0.164 (4.165)	0.177 (4.495)
	4	FRONT	0.162 (4.114)	0.167 (4.241)
		REAR	0.165 (4.191)	0.184 (4.673)
B1651	1	FRONT	0.150 (3.810)	0.134 (3.403)

INTAKE SERIAL NO.	ENGINE NO.	RAMP	CLEARANCE SIDEWALL inches (millimetres)	CLEARANCE CENTRE WALL inches (millimetres)
		REAR	0.172 (4.368)	0.139 (3.530)
	2	FRONT	0.135 (3.429)	0.121 (3.073)
		REAR	0.146 (3.708)	0.142 (3.606)
B1654	3	FRONT	0.145 (3.683)	0.171 (4.343)
		REAR	0.155 (3.937)	0.184 (4.673)
	4	FRONT	0.182 (4.622)	0.190 (4.826)
		REAR	0.174 (4.419)	0.206 (5.232)
B1863	1	FRONT	0.180 (4.572)	0.142 (3.606)
		REAR	0.194 (4.927)	0.158 (4.013)

INTAKE SERIAL NO.	ENGINE NO.	RAMP	CLEARANCE SIDEWALL inches (millimetres)	CLEARANCE CENTRE WALL inches (millimetres)
	2	FRONT	0.131 (3.327)	0.191 (4.851)
		REAR	0.135 (3.429)	0.195 (4.953)
B1864	3	FRONT	0.113 (2.870)	0.121 (3.073)
		REAR	0.174 (4.419)	0.156 (3.962)
	4	FRONT	0.172 (4.368)	0.147 (3.733)
		REAR	0.184 (4.673)	0.163 (4.140)
B1867	1	FRONT	0.129 (3.276)	0.114 (2.895)
		REAR	0.133 (3.378)	0.131 (3.327)
	2	FRONT	0.133 (3.378)	0.161 (4.089)

INTAKE SERIAL NO.	ENGINE NO.	RAMP	CLEARANCE SIDEWALL inches (millimetres)	CLEARANCE CENTRE WALL inches (millimetres)
		REAR	0.145 (3.683)	0.190 (4.826)
B1868	3	FRONT	0.098 (2.489)	0.126 (3.200)
		REAR	0.123 (3.124)	0.139 (3.530)
	4	FRONT	0.164 (4.165)	0.158 (4.013)
		REAR	0.151 (3.835)	0.178 (4.521)

Ramp-to-Tooling-button Clearances
Table 501

(6) If the clearances are not within the required limits, adjust the appropriate link(s) as detailed in operation (7). If satisfactory, ignore operation (7) and proceed with operation (8).

(7) If applicable, adjust either link (Ref. Fig. 503) as follows:-

(a) Remove the split pin, nut and washer from the bolt securing the link to the associated torque tube lever.

(b) Remove the bolt; rest the ramp on the tooling buttons.

(c) Disengage the eye-end of the link from the torque tube lever sufficiently to allow the eye-end to be rotated.

(d) Loosen the link locknut.

(e) Shorten or lengthen the link by rotating the eye-end as required.

NOTE: One half-turn of a front ramp link eye-end will produce a change of 0.041 in (1.0414 mm) at the ramp tip. One half-turn of a rear ramp link eye-end will produce a change of 0.037 in (0.9398 mm) at the ramp tip.

(f) Ensure that the slots on the upper and lower parts of the link are aligned to within 1 deg, and the threads are in safety.

(g) Torque-tighten the appropriate locknut as follows:-

g1) Front ramp link: 280 to 300 lbf in (3.164 to 3.390 mdaN).

g2) Rear ramp link: 340 to 360 lbf in (3.842 to 4.068 mdaN).

(h) Engage the eye-end of the link in the torque tube lever; align the holes and insert the bolt.

(i) Repeat operations (4) and (5) and check the clearance at each button position.

(j) Fit the washer and nut to the bolt securing the link to the torque tube lever.

CAUTION: IN OPERATION (k), THE SPLIT PIN LEGS MUST NOT BE BENT OVER THE END OF THE BOLT.

(k) Torque-tighten the nut to between 220 and 350 lbf in (2.486 and 3.955 mdaN). Fit a split pin to the nut. Turn the split pin legs in opposite directions around the nut; press the legs hard against the nut to prevent the split pin from turning. Encapsulate the head and legs of the split pin with sealant in accordance with 20-22-19.

(l) Wire-lock the link locknut in accordance with 20-21-13.

(8) Rotate, manually, the actuator screwjack bodies to raise the ramps sufficiently to increase the clearance between the ramps and tooling buttons. Remove the tooling buttons.

(9) Carry out backlash checks, as follows:-

(a) Position a dial test indicator (DTI), rigidly supported, under one front ramp link, at its attachment point to the ramp.

(b) Hold the associated side of the rear ramp down and set the DTI at zero or, alternatively, record the DTI reading.

(c) Move, and hold, the rear ramp up; check that the free movement, indicated on the DTI, is not more than 0.050 in (1.270 mm).

(d) Repeat operations (a) to (c) at the other front ramp link.

(e) Position the DTI under a rear ramp link, at its attachment point to the ramp.

(f) Hold the associated side of the front ramp down and set the DTI at zero or, alternatively, record the DTI reading.

(g) Move, and hold, the front ramp up; check that the free movement, indicated on the DTI, is not more than 0.050 in (1.270 mm).

(h) Repeat operations (e) to (g) at the other rear ramp link.

(10) Remove the dial test indicator.

(11) Check the clearances between the front ramp and the actuator, and between the front ramp and the flanges of both torque tube forward bearing mountings (Ref. Fig. 501) as follows:-

(a) Place modelling clay (Plasticine, or similar) on the lowest parts of the actuator and along the bottom of both flanges of the forward bearing mountings.

(b) Rotate, manually, the actuator screwjack bodies and fully raise the ramps, and then lower them sufficiently to gain access to the Modelling clay.

(c) Remove the modelling clay; check that the minimum clearances are as follows:=

c1) Between the ramp and the flange of each forward bearing mounting: 0.15 in (3.81 mm).

c2) Between the ramp and the lowest parts of the actuator: 0.23 in (5.84 mm).

(12) Manually move (by rotating the actuator screwjack bodies) the ramps from fully up to fully down, checking throughout the operating range that the clearances (Ref. Fig. 502) are as follows:-

(a) Between the edges of the rear ramp and fillet fairing, and both walls of the intake, measured at the peaks of the walls undulations (Detail E, dimension Z): 0.120 in (3.048 mm) min. to 0.350 in (8.890 mm) max.

(b) Between the edge of each front ramp side seal and the associated wall of the intake (Detail C, dimension X): 0.020 in (0.508 mm) max. clearance to 0.020 in (0.508 mm) max. interference.

NOTE: If the clearance requirement of operation (b) is not met, adjust the position of the seal as detailed in operation (13).

(c) Between the edge of each retaining strip and the associated wall of the intake (Detail C, dimension U): 0.100 in (2.540 mm) minimum.

(d) Between the seal member and the front ramp bottom skin (Detail D, dimension Y): 0.020 to 0.050 in (0.508 to 1.270 mm).

(13) Adjust the clearance between either front ramp side seal and the intake wall, as follows:-

(a) Loosen the bolts securing the retaining strip and seal sufficiently to allow the seal to move.

(b) Carefully move the seal in the direction necessary to achieve the requirement of operation (12)(b), at the same time ensuring that the requirement of operation (12)(c) is maintained.

(c) Torque-tighten the bolts in the retaining strip anchor nuts to between 20 and 25 lbf in (0.226 and 0.282 mdaN).

(d) Torque-tighten the remaining bolt to between 30 and 40 lbf in (0.339 and 0.452 mdaN).

(e) Repeat operations (12)(b) and (12)(c) to check clearances.

(14) Reset the actuator brake, as follows:-

(a) Engage the brake by following the instructions on the label, in reverse order.

(b) Remove the brake release tool.

(c) Fit the plug to the brake unit; torque-tighten the plug to between 133 and 177 lbf in (1.503 and 2.000 mdaN). Wire-lock the plug in accordance with 20-21-13.

(15) Recheck the clearance between the front ramp and the actuator, and between the front ramp and the flanges of both torque tube forward bearing mountings (Ref. Fig. 501), using hydraulic power, as follows:-

(a) Place modelling clay (Plasticine, or similar) on the lowest parts of the actuator and along the bottom of both flanges of the forward bearing mountings.

<u>WARNING:</u> ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(b) According to which hydraulic system is to be

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used and which ramps are being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(c) Make available electrical ground power as detailed in 24-41-00.

(d) Pressurize the appropriate hydraulic system (Ref. Chap.29) to 2,000 psi (138 bar), with the application of power controlled by a responsible person associated with work on the intakes.

(e) At the intake management panel, remove the anti-interference plate. Using the appropriate RAMP switch in an inching mode, fully raise the ramps. Release the switch.

(f) Hold the RAMP switch at "LOWER" until the ramps are fully lowered. Release the switch.

(g) Depressurize the hydraulic system.

(h) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(i) Trip the circuit breaker reset in operation (b) and fit a safety clip.

(j) Refit, and lock, the anti-interference plate to the intake management panel.

(k) Remove the modelling clay; check that the minimum clearances are as follows:-

k1) Between the ramp and the flange of each forward bearing mounting: 0.15 in (3.81 mm).

k2) Between the ramp and the lowest parts of the actuator: 0.23 in (5.84 mm).

D. Conclusion

(1) Carry out a Functional Test (Ref. para.3.).

3. Functional Test

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Protective cover, for intake lip	D926806000
Servicing extension (springboard)	-
Work stand	-
Crawling board	-
Cover, for engine transition ring	D935036001
Stopwatch	-

B. Prepare to Test

(1) Ensure that the four intakes are clear of personnel and equipment.

(2) Position barriers to prevent persons from inadvertently entering the areas below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes,

particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out inside the intakes.

(4) On the intake management panel, proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins to the spill door hydraulic selector valves of the four intakes (Ref. 71-62-00, Servicing).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

(8) Fit, and secure, the protective cover to the intake lip.

(9) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(10) Place the crawling board on the floor of the intake, aft of the servicing extension.

(11) Fit the cover to the engine transition ring.

C. Test

(1) According to which hydraulic system is to be used and which ramps are being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

WARNING: DO NOT LEAVE THE PANEL UNGUARDED UNTIL THE TEST IS CONCLUDED.

(2) Remove the anti-interference plate from the intake management panel.

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Pressurize the appropriate hydraulic system to the normal operating pressure (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intake.

CAUTION: IN OPERATIONS (5) AND (6), IF SNUBBING IS NOT EVIDENT, THE FAULT MUST BE RECTIFIED BEFORE PROCEEDING.

(5) On the intake management panel, hold the appropriate RAMP switch at "RAISE", checking that the ramps move smoothly and that snubbing occurs just before the ramps are fully raised. Release the switch.

NOTE: Snubbing is recognized by the sudden

reduction in the rate of the ramps movement as the actuator nears its end-of-stroke position.

(6) Hold the appropriate RAMP switch at "LOWER", checking that the ramps move smoothly and that snubbing occurs just before the ramps are fully lowered. Release the switch.

(7) Hold the appropriate RAMP switch at "RAISE" and simultaneously start the stopwatch; check that the ramps are fully raised, including snubbing, within 7.5 and 8.9 s. Release the switch.

(8) Hold the RAMP switch at "LOWER" and simultaneously start the stopwatch; check that the ramps are fully lowered, including snubbing, within 4.9 to 5.4 s. Release the switch.

(9) Hold the RAMP switch at "RAISE" until the ramps are fully raised. Release the switch.

(10) Depressurize the hydraulic system.

(11) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(12) Refit, and lock, the anti-interference plate to the intake management panel.

(13) Trip the circuit breaker reset in operation (1) and fit a safety clip.

D. Conclusion

<u>CAUTION:</u> AFTER REMOVAL OF TOOLS AND EQUIPMENT, THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(1) Remove all tools and equipment from the intake and ensure that the intake interior is clean.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) Refit the access panels previously removed.

(4) At the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) Set all HYD switches to "AUTO".

(c) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(5) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.B.(6) and (7).

(6) Remove the warning placard from the engine start panel.

(7) Remove the barriers from the intake entries and from beneath the spill doors.

RAMP ACTUATION MECHANISM - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

R IN ADDITION, IT MUST BE ENSURED THAT HYDRAULIC POWER
R IS NOT APPLIED TO THE APPROPRIATE MAIN (GREEN OR BLUE)
R SYSTEM AND THE STANDBY (YELLOW) SYSTEM.

1. General

Two ramp actuation mechanisms are fitted in each engine air intake, immediately below the boundary layer floor. One is attached to the sidewall and the other to the centre wall, each by three bearing assemblies.

When removing a sidewall mechanism it is necessary to disconnect the actuator and ramps only, but when removing a centre wall mechanism, the ramp position indicator resolver must also be disconnected.

Prior to installing the mechanism, a pre-fit is required to ascertain the thickness of any packers/shims required.

2. Ramp Actuation Mechanism

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000

DESCRIPTION	PART NO.
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Protective cover, for intake lip	D926806000
Servicing extension (springboard)	-
Work stand	-
Crawling board	-
Cover, for engine transition ring	D935036001
Support block, for front ramp	D925453000
Support block, for rear ramp	D925453001
Torque spanner, 40 to 45 lbf in (0.452 to 0.508 mdaN)	-
Torque spanner, 100 to 120 lbf in (1.130 to 1.356 mdaN)	-
Torque spanner, 160 to 180 lbf in (1.808 to 2.034 mdaN)	-
Torque spanner, 215 to 240 lbf in (2.429 to 2.712 mdaN)	-
Spring balance	-
Viton sealant	-

B. Prepare to Remove

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes, particularly when hydraulic power is

applied.

(3) Display a warning placard on the engine start panel to indicate that work is being carried out in the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the four HYD switches to "MAN".

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
INT 1 RAMP & SPILL POSN IND	2-213	1E541	E14
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	2J1	E2
ENG 3 RH IGNITION CONT	1-213	2J2	P6
INT 2 RAMP & SPILL POSN IND	4-213	2E541	E17

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
INT 3 RAMP & SPILL POSN IND	4-213	3E541	F17
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6
INT 4 RAMP & SPILL POSN IND	2-213	4E541	F14

(8) Fit, and secure, the protective cover to the intake lip.

(9) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(10) Place the crawling board on the floor of the intake, aft of the servicing extension.

(11) Fit the cover to the engine transition ring.

(12) Disconnect the links from the front and rear ramps as detailed in 71-63-12.

(13) Disconnect the actuator from the mechanism as detailed in 71-63-11.

(14) If a centre wall mechanism is to be removed, disconnect the ramp position indicator resolver from the torque tube as detailed in 71-63-14.

**ON A/C 001-002,

C. Remove (Ref. Fig. 401)

R **ON A/C 003-007,

C. Remove (Ref. Fig. 402)

(1) Remove the split pins, nuts, washers and bolts securing the forward bearing assembly.

(2) Remove the split pins, nuts, washers and bolts securing the rear bearing assembly.

(3) Support the mechanism; remove the split pins, nuts, washers and bolts securing the centre bearing assembly.

(4) Manoeuvring the mechanism as required, carefully remove it from the intake. Retain any packers/ shims that are fitted at the bearing mountings.

D. Prepare to Install (Pre-fit)

(1) Ensure that the safety precautions taken in operations B.(2) to (7) have not been cancelled.

(2) Carefully position the mechanism in the intake. Do not insert packers/shims at any position at this stage.

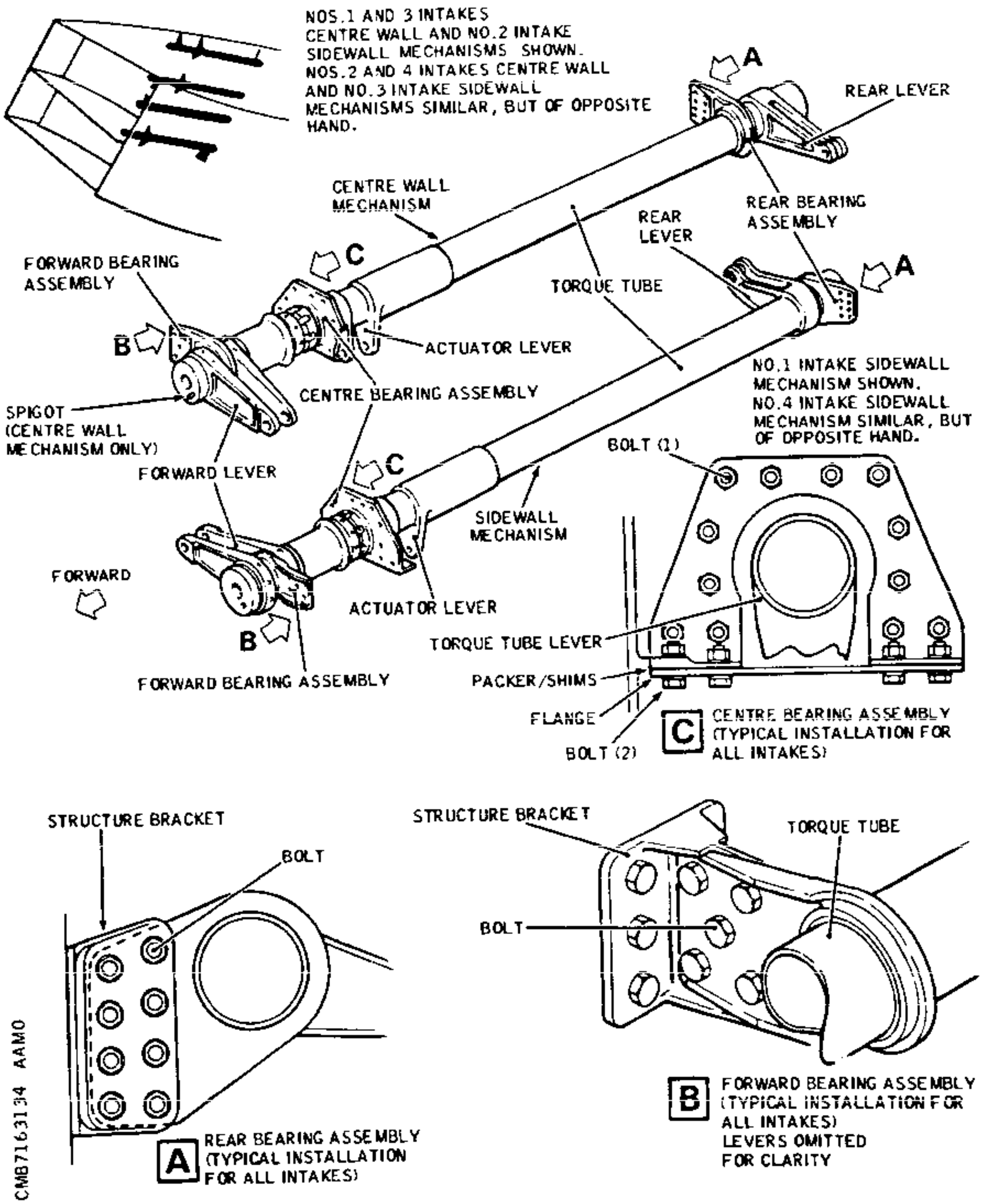
(3) With the countersunk side of the hole in the washers toward the bolt heads, fit the twelve bolts (1), with their heads facing forward, to secure the centre bearing assembly to the structure.

(4) Insert the four bolts (2) downward at this stage, but do not fit nuts.

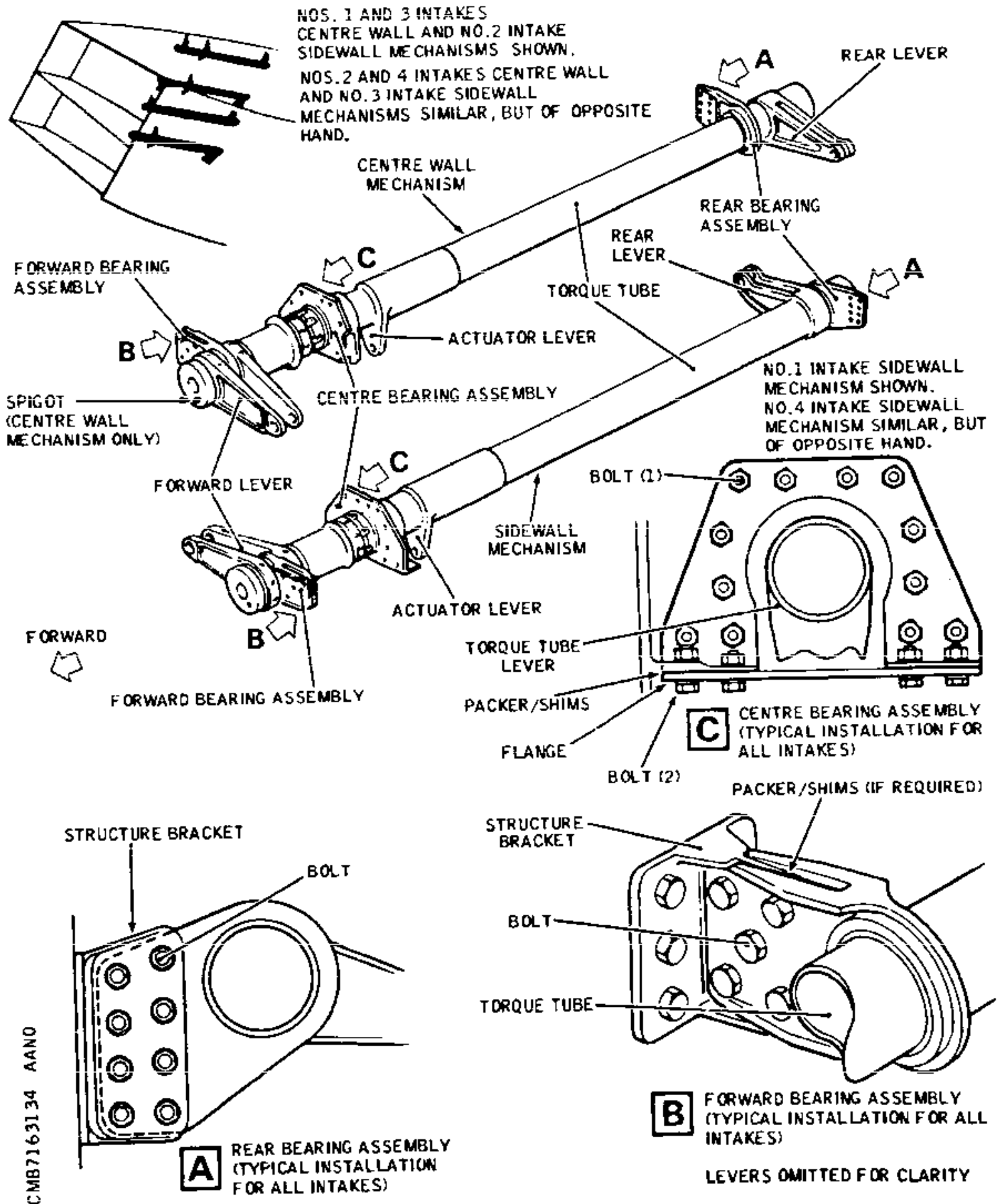
(5) Fit washers and nuts to the bolts (1); torque-tighten the nuts to between 100 and 120 lbf in (1.130 and 1.356 mdaN).

(6) With the countersunk side of the hole in the washers toward the bolt heads, fit the bolts (with their heads facing forward), washers and nuts to secure the rear bearing assembly to the structure bracket.

**ON A/C 001-002,



\- Ramp Actuation Mechanism - Installation
Figure 401



\- Ramp Actuation Mechanism - Installation
Figure 402

(7) With the countersunk side of the hole in the washers toward the bolt heads, fit the bolts (with their heads facing forward), washers and nuts to secure the forward bearing assembly to the structure bracket.

R **ON A/C 003-007,

CAUTION: IN OPERATION (7), NO MORE THAN TWO SHIMS MAY BE USED, OF A TOTAL THICKNESS NOT EXCEEDING 0.015 in (0.38 mm).

IF THE GAP EXCEEDS 0.015 in (0.38 mm), USE PACKERS TO A MAXIMUM THICKNESS OF 0.03973 in (1.0 mm), PLUS THE REQUISITE THICKNESS OF SHIMS.

(7) Insert the bolts to retain the forward bearing assembly in position. Slide the bearing forward so that the inside rear face of the fork is tight against the structure bracket. Measure and record the gap between the inside forward face of the fork and the bracket; obtain packers/shims of the equivalent thickness.

CAUTION: IN OPERATION (8), NO MORE THAN TWO SHIMS MAY BE USED, OF A TOTAL THICKNESS NOT EXCEEDING 0.015 in (0.38 mm).

IF THE GAP EXCEEDS 0.015 in (0.38 mm), USE PACKERS TO A MAXIMUM THICKNESS OF 0.03973 in (1.0 mm), PLUS THE REQUISITE THICKNESS OF SHIMS.

(8) Measure and record the gap between the flange and structure at the centre bearing assembly. Obtain packers/shims of the equivalent thickness.

(9) Remove all nuts, washers, bolts and washers from all assemblies and carefully remove the mechanism.

E. Install

(1) Ensure that the safety precautions taken in operations B.(2) to (7) have not been cancelled.

(2) Apply sealant in accordance with 20-22-12, to the mating faces of the bearing mountings and packers/shims.

(3) Carefully manoeuvre the mechanism into position,

at the same time inserting the packers/shims.

(4) With the countersunk side of the hole in the washers toward the bolt heads, insert all horizontal bolts, with their heads forward, to secure the three bearing assemblies. Fit washers and nuts to all bolts.

(5) Fit the four bolts (2) from below, i.e., heads downward, and the washers and nuts.

(6) Torque-tighten the nuts as follows:-

(a) The centre bearing nuts: to between 100 and 120 lbf in (1.130 and 1.356 mdaN).

(b) The forward bearing nuts: to between 215 and 240 lbf in (2.429 and 2.712 mdaN).

(c) The rear bearing nuts: to between 160 and 180 lbf (1.808 and 2.034 mdaN).

(7) Lock all nuts with split pins.

(8) Encapsulate the items securing the three bearing assemblies, namely, the bolt heads and washers, the bolt tails, washers, nuts and split pins, and the immediate surrounding areas with Viton sealant in accordance with 20-22-19.

(9) Check that the mechanism operates smoothly, as follows:-

(a) Fit a suitable slave bolt through the fork-end of the rear lever.

(b) Attach a suitable spring balance to the slave bolt.

(c) With the spring balance at an angle of 90 deg to the lever and following the arc of travel, check that the load required to just move the mechanism over its full range of travel, in both directions, does not exceed 14 lbf (62.275 N).

(10) If a centre wall mechanism is being installed, fit the spigot as follows:-

(a) Lubricate the spigot threads with Aeroshell grease No.16.

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(b) Fit the spigot to the mechanism; torque-tighten the spigot to between 40 and 45 lbf in (0.452 and 0.508 mdaN).

(11) At the centre wall mechanism only, connect the ramp position indication resolver to the spigot as detailed in 71-63-14.

(12) Connect the actuator to the mechanism as detailed in 71-63-12.

(13) Connect the front and rear ramp links to the mechanism as detailed in 71-63-12.

F. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT, THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(1) Remove all tools and equipment from the intake, and ensure that the intake interior is clean.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) Refit the access panels previously removed.

(4) At the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) Set all HYD switches to "AUTO".

(c) Leave the four RAMP/SPILL MASTER switches at the MAN position.

(5) Remove the safety clips and reset the circuit breakers previously tripped.

(6) Remove the warning placard from the engine start panel.

(7) Remove the barriers from the intake entries and from beneath the spill doors.

RAMP POSITION INDICATOR RESOLVER ASSEMBLY - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

R IN ADDITION, IT MUST BE ENSURED THAT HYDRAULIC POWER
R IS NOT APPLIED TO THE APPROPRIATE MAIN (GREEN OR BLUE)
R SYSTEM AND THE STANDBY (YELLOW) SYSTEM.

1. General

One resolver assembly is attached to the structure and is connected, through a link and lever assembly, to the forward end of the ramps actuation torque tube at the centre wall position in each intake.

Access to each assembly is gained by entering the associated intake.

2. Ramp Position Indicator Resolver Assembly (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000

DESCRIPTION	PART NO.
Protective cover, for intake lip	D926806000
Servicing extension (springboard)	-
Work stand	-
Crawling board	-
Cover, for engine transition ring	D935036001
Pinion wrench, for resolver adjustment	F500/9
Support block, for front ramp	D925453000
Torque spanner, 12 to 15 lbf in (0.136 to 0.169 mdaN)	-
Torque spanner, 70 to 80 lbf in (0.791 to 0.904 mdaN)	-
Aeroshell grease No.16	-
Locking wire	-

B. Prepare

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out in the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to

"MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
INT 1 RAMP & SPILL POSN IND	2-213	1E541	E14
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
INT 2 RAMP & SPILL POSN IND	4-213	2E541	E17

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
INT 3 RAMP & SPILL POSN IND	4-213	3E541	F17
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6
INT 4 RAMP & SPILL POSN IND	2-213	4E541	F14

(8) The ramps must be fully lowered, so, if applicable, proceed as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) According to which hydraulic system is to be used and which ramps are being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(c) Make available electrical ground power as detailed in 24-41-00.

(d) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(e) At the intake management panel, remove the anti-interference plate; hold the appropriate RAMP switch at "LOWER" until the ramps are fully lowered. Release the switch.

(f) Depressurize the hydraulic system.

(g) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(h) Trip the circuit breaker reset in operation (b) and fit a safety clip.

(i) Refit, and lock, the anti-interference plate to the intake management panel.

(9) Disconnect both links of the front ramp from the torque tube levers as detailed in 71-63-12, Removal/Installation.

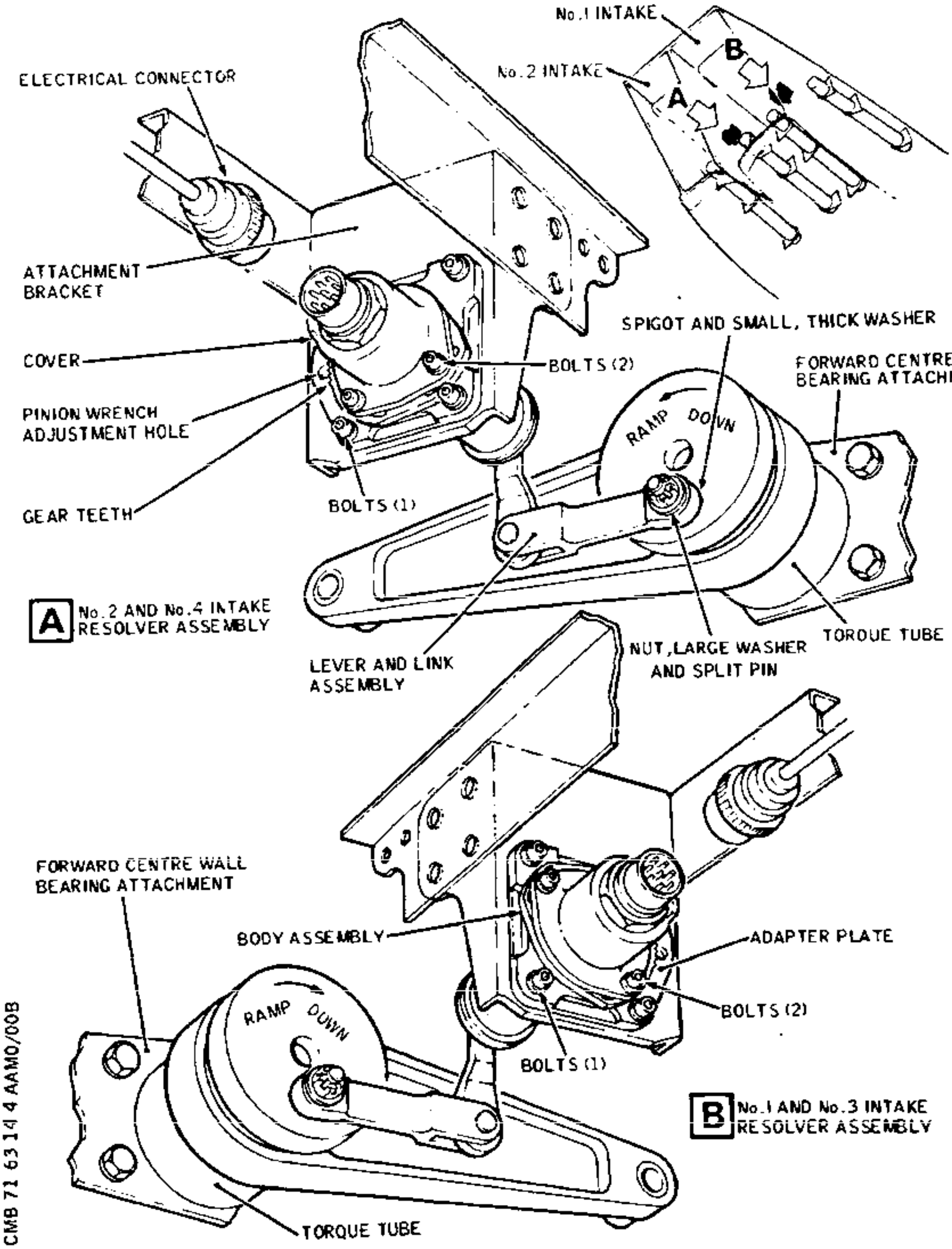
(10) Position the support block and rest the front ramp upon it.

C. Remove

(1) Disconnect the electrical connector from the resolver assembly.

(2) Remove the split pin, nut and large washer securing the lever and link assembly to the spigot.

(3) Remove the four bolts (1) securing the adapter plate to the attachment bracket.



Ramp Position Indicator
Resolver Assembly - Installation
Figure 401

(4) Carefully ease the adapter plate from the attachment bracket and simultaneously slide the lever and link assembly off the spigot.

(5) Remove the resolver assembly complete with the lever and link, manoeuvring the lever and link through the hole in the attachment bracket as required.

(6) Remove the small, thick washer from the spigot.

D. Prepare to Install

(1) Insert the pinion wrench in its hole in the adapter plate, ensuring that the wrench fully engages the gear teeth.

(2) Using the wrench, check that the resolver body assembly can be rotated, but with some resistance (i.e., not too easily). If necessary, loosen or tighten the three bolts (2) to achieve this condition.

(3) Set the gear teeth central (approximately) about the hole in the adapter plate. Remove the wrench.

(4) Lubricate the bolts (1) and the spigot with Aeroshell No.16 grease in accordance with 20-24-16.

E. Install

(1) Ensure that the safety precautions taken in operations B.(2) to (7) have not been cancelled.

(2) Apply sealant in accordance with 20-22-12, to the mating faces of the adapter plate and the attachment bracket.

(3) Place the small, thick washer on the spigot, with the countersunk side of the hole in the washer toward the base of the spigot.

(4) Manoeuvre the lever and link assembly through the hole in the attachment bracket.

CAUTION: IN OPERATION (5) THE LEVER AND LINK ASSEMBLY MUST BE POSITIONED CORRECTLY, OTHERWISE ERRONEOUS ELECTRICAL SIGNALS WILL RESULT.

(5) Ensure that the holes in the adapter plate and

attachment bracket are aligned; position the adapter plate and simultaneously slide the lever and link on to the spigot, ensuring that the appropriate lever and link is positioned in the same line as illustrated (Ref. Fig. 401), Detail A or B.

(6) Fit the four bolts (1). Torque-tighten the bolts to between 70 and 80 lbf in (0.791 and 0.904 mdaN).

(7) Lock the bolts (1), in pairs, with locking wire in accordance with 20-21-13.

(8) Fit the large washer and nut to the spigot. Torque-tighten the nut to between 12 and 15 lbf in (0.136 and 0.169 mdaN). Fit a split pin.

C. Conclusion

(1) Adjust the resolver, refit the front ramp links and carry out a Functional Test as detailed in Adjustment/Test.

RAMP POSITION INDICATOR RESOLVER ASSEMBLY - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

R IN ADDITION, IT MUST BE ENSURED THAT HYDRAULIC POWER
R IS NOT APPLIED TO THE APPROPRIATE MAIN (GREEN OR BLUE)
R SYSTEM AND THE STANDBY (YELLOW) SYSTEM.

1. General

One resolver assembly is attached to the structure and is connected, through a link and lever assembly, to the forward end of the ramps actuation torque tube at the centre wall position in each intake.

Each resolver assembly is electrically adjusted during manufacture or overhaul and should not require further adjustment after installation on an aircraft.

To make the indicator displays (0 to 100 per cent) compatible with the signals from the associated resolver, any adjustment should be made at the appropriate potentiometers of the indicator.

This topic contains the adjustment procedures, and a Functional Test to prove the integrity of the ramps position indication system, under the following headings:-

Resolver Assembly Adjustment

Indicator Potentiometers Adjustment

Functional Test

After any adjustment a Functional Test must be carried out,

but the Test can be used at any time to check the integrity of the system. Operational and System Tests are not applicable in this instance.

2. Resolver Assembly Adjustment

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Protective cover, for intake lip	D926806000
Servicing extension (springboard)	-
Work stand	-
Crawling board	-
Cover, for engine transition ring	D935036001
Brake release tool	E925089000
R Resolver test set (includes power loom Pt. No.TE6049201 and ramp resolvers loom Pt. No.TE6049202)	TE6049000
Ramp actuator gauge, for mid-stroke setting	E925053000
Pinion wrench, for resolver adjustment	F500/9
Support block, for front ramp	D925453000
Torque spanner, 35 to 40 lbf in (0.395 to 0.452 mdaN)	-

DESCRIPTION	PART NO.
Torque spanner, 133 to 177 lbf in (1.503 to 2.000 mdaN)	-
Locking wire	-

B. Prepare to Adjust Resolver Assembly

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out in the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
INT 1 RAMP & SPILL POSN IND	2-213	1E541	E14
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
INT 2 RAMP & SPILL POSN IND	4-213	2E541	E17
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
INT 3 RAMP & SPILL POSN IND	4-213	3E541	F17
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6
INT 4 RAMP & SPILL POSN IND	2-213	4E541	F14

(8) The ramps must be fully lowered, so, if applicable, proceed as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) According to which hydraulic system is to be used and which ramps are being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(c) Make available electrical ground power as detailed in 24-41-00.

(d) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(e) At the intake management panel, remove the anti-interference plate; hold the appropriate RAMP switch at "LOWER" until the ramps are fully lowered. Release the switch.

(f) Depressurize the hydraulic system.

(g) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(h) Trip the circuit breaker reset in operation (b) and fit a safety clip.

(i) Refit, and lock, the anti-interference plate to the intake management panel.

(9) Disconnect both links of the front ramp from the torque tube levers as detailed in 71-63-12, Removal/Installation.

(10) Position the support block and rest the front ramp upon it.

(11) Using the ramp actuator gauge, set the actuator to the mid-stroke position, as follows:-

(a) Remove the plug from the brake unit on the actuator. (Ref. 71-63-11, Removal/ Installation).

(b) Using the brake release tool as detailed on the attached label, disengage the brake.

CAUTION: BEFORE CARRYING OUT OPERATION (c), ENSURE THAT THE REAR RAMP AND ACTUATION MECHANISM ARE CLEAR OF OBSTRUCTION.

(c) Adjust the mid-stroke position by rotating the screwjack bodies until the gauge is a sliding fit between each screwjack body and the associated trunnion fork-end.

(d) Engage the brake by following the instructions on the label, in reverse. Remove the brake release tool from the actuator.

(12) Disconnect the electrical connector from the resolver.

R (13) Connect the resolver test set as follows:-

(a) Ensure that the ON - OFF switch on the test set is at the OFF position.

(b) Connect the appropriate end of the power loom to the connector PL1 on the test set and connect the other end to a 115 V 400 Hz electrical supply.

(c) Connect the single end of the ramp resolver loom to the connector PL2 on the test set and connect the appropriate tail to the fixed connector on the resolver.

(d) On the test set, set the RESOLVER SELECT switch to "INDICATION".

(e) Set the ON - OFF switch to "ON"; check that the angle position indicator is illuminated.

C. Adjust Resolver Assembly

(1) If applicable, loosen the three socket-head bolts securing the cover and body to the adapter plate.

(2) Insert the pinion wrench in the hole in the adapter plate, ensuring that the wrench fully engages the gear teeth.

(3) Rotate the resolver body until the test set reading agrees with that listed in Table 501 for the appropriate intake.

INTAKE	TEST SET READING
1 or 3	90 deg (±30 min)
2 or 4	0 (360) deg (±30 min)

Resolver Signals
Table 501

(4) Remove the pinion wrench.

(5) Torque-tighten the three socket-head bolts (securing the cover and body to the adapter plate) to between 35 and 40 lbf in (0.395 and 0.452 mdaN).

(6) Check that the test set reading still agrees with that listed in Table 501.

R (7) Switch off the test set and then disconnect the loom
R from the resolver.

(8) Reconnect the electrical connector to the resolver, ensuring that the mating surfaces are clean and undamaged.

(9) Interlock the three bolts with locking wire in accordance with 20-21-13.

(10) Using the brake release tool as detailed on the attached label, disengage the brake.

(11) Rotate the screwjack bodies and fully lower the ramps.

(12) Engage the brake by following the instructions on the label, in reverse. Remove the brake release tool from the actuator.

(13) Refit the plug to the brake unit on the actuator. Torque-tighten the plug to between 133 and 177 lbf in (1.503 and 2.000 mdaN); wire-lock the plug in accordance with 20-21-13.

(14) Reconnect both links of the front ramp to the torque tube levers as detailed in 71-63-12, Removal/Installation. Remove the support block.

3. Indicator Potentiometers Adjustment

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 501.

A. Prepare to Adjust Potentiometers

(1) If applicable, carry out operations 2.B.(1) to (7).

B. Adjust Potentiometers

(1) Remove the safety clip and reset the INT (1, 2, 3 or 4) RAMP & SPILL POSN IND circuit breaker associated with the resolver being adjusted (Ref. para.2.B.(7)).

(2) Operate the ramps, and, if necessary, adjust the potentiometers as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS,

AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) According to which hydraulic system is to be used and which ramps are being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.2.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(c) Make available electrical ground power as detailed in 24-41-00.

(d) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(e) At the intake management panel, remove the anti-interference plate; hold the appropriate RAMP switch at "LOWER" to ensure that the ramps are fully lowered. Release the switch.

(f) Check that the position indicator displays 100 per cent.

(g) If necessary, release the manual control panel (Ref. 71-61-22) to gain access to the associated ramp position indicator full scale adjusting potentiometer, No.1 ENGINE RV3, No.2 ENGINE RV9, No.3 ENGINE RV3 or No.4 ENGINE RV9, as applicable. Adjust as necessary to align the indicator pointer with the 100 per cent graduation on the scale.

(h) Hold the RAMP switch at "RAISE" until the ramps are fully raised. Release the switch.

(i) Check that the position indicator displays 0 per

cent.

(j) If necessary, adjust the associated ramp position indicator zeroing potentiometer, No.1 ENGINE RV2, No.2 ENGINE RV8, No.3 ENGINE RV2 or No.4 ENGINE RV8, to align the indicator pointer with the 0 per cent graduation on the scale.

(k) Hold the RAMP switch at "LOWER". Recheck that the RAMP position indicator displays 100 per cent when the ramps are fully down. Release the switch. If necessary, readjust the potentiometer until the indicator reading is correct, then repeat operations (h), (i) and (j). Repeat this process until the indicator reading is correct at 0 per cent and 100 per cent (this procedure is necessary because of interaction between the two trim potentiometers).

(l) Depressurize the hydraulic system.

(m) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(3) Refit the manual control panel (Ref. 71-61-22).

(4) Refit and lock the anti-interference plate to the intake management panel.

(5) Carry out a Functional Test (Ref. para.4.).

4. Functional Test

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

DESCRIPTION	PART NO.
Locking pins, for selector valve	E925037000
Locking pins for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000

B. Prepare to Test

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out in the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-215	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	3-213	3J1	E3
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

C. Test

(1) According to which hydraulic system is to be used and which ramps are being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

WARNING: DO NOT LEAVE THE PANEL UNGUARDED UNTIL THE TEST IS CONCLUDED.

(2) Remove the anti-interference plate from the intake management panel.

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Pressurize the appropriate hydraulic system to the normal operating pressure (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intake.

(5) On the intake management panel, hold the appropriate RAMP switch at "RAISE"; check that the indicator needle moves to, or is at, 0 per cent. Release the switch.

(6) Hold the RAMP switch at "LOWER"; check that the indicator needle moves smoothly from 0 to 100 per cent. Release the switch.

(7) Hold the RAMP switch at "RAISE"; check that the indicator needle moves smoothly from 100 to 0 per cent. Release the switch.

(8) Depressurize the hydraulic system.

(9) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(10) Refit, and lock, the anti-interference plate to the intake management panel.

(11) Trip the circuit breaker reset in operation (1) and fit a safety clip.

D. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT, THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(1) Remove all tools and equipment from the intake, and ensure that the intake interior is clean.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) At the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) Set all HYD switches to "AUTO".

(c) Leave the four RAMP/SPILL MASTER switches at the MAN position.

(4) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.B.(6) and (7)).

(5) Remove the warning placard from the engine start panel.

(6) Remove the barriers from the intake entries and from beneath the spill doors.

END OF THIS
SECTION

NEXT

SPILL DOOR ACTUATION - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)

A spill door, incorporating a vane, and an actuation mechanism are part of the engine air supply control system in each intake.

The spill door is operated by an actuator (Ref. 71-62-00) which is connected to the sidewall actuation mechanism and under the control of the air intake control system (AICS) (Ref. 71-61-00). The spill door opens downward to spill air in excess of the engine requirements.

When the spill door is closed the vane is free to open or close, depending upon engine air demands. The vane opens inward to allow extra air to enter the intake.

When the vane opens during icing conditions, two microswitches, part of an assembly, provide control and indication of the de-iced area of the 'D' box (Ref. Chap.30).

Two hydraulic dampers (not associated with the aircraft hydraulic systems) are housed within the spill door structure and are connected through linkages to the vane hinges; the dampers prevent the vane from oscillating under certain conditions, for example, if the engine surges.

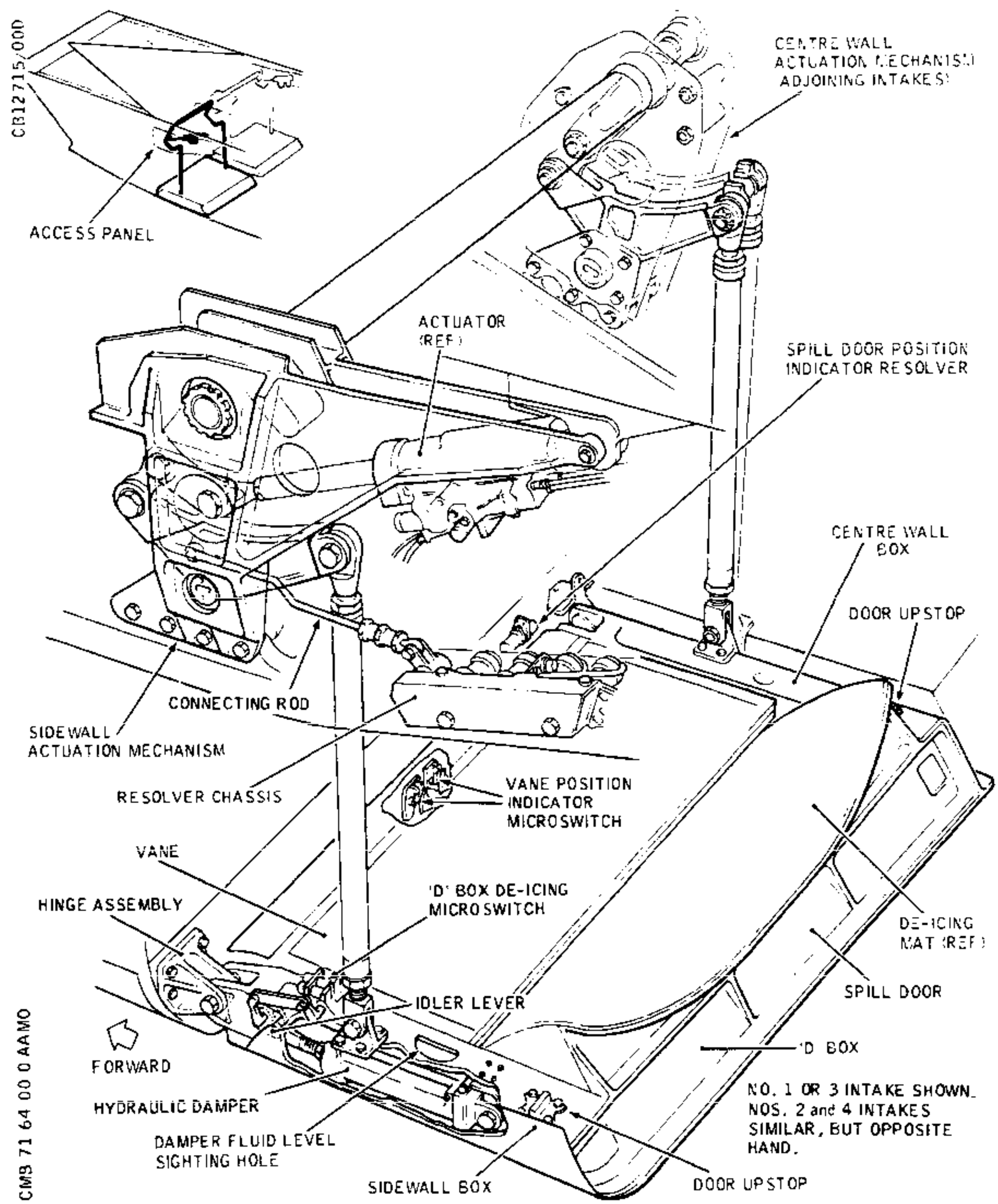
R

In flight, when the spill door opens under the control of the AUTO mode of the AICS, the air pressure on the top surface of the vane is greater than the pressure on the bottom surface; thus the vane and spill door move as one.

A resolver chassis, comprising four resolvers, is bolted to the nacelle structure at the sidewall position and is connected by a rod to the sidewall actuation mechanism. The resolvers supply electrical signals to the AICS.

Another resolver assembly is bolted to the nacelle structure at the centre wall position and is connected by a link and lever to the spill door. The resolver supplies electrical signals to an indicator on the intake management panel (Ref. 71-61-00) to show the position as a percentage of the spill door opening.

Two microswitches, part of an assembly, are bolted to the nacelle structure in the centre of the hinge end of the spill door. The microswitches, actuated by striker plates bolted to brackets on the leading edge of the vane, supply



-

Spill Door Actuation
Figure 001

R

electrical signals to a magnetic indicator in the intake management panel to show if the vane is open or closed. Between the vane fully open and fully closed positions the indicator displays diagonal stripes.

R 2. Spill Door (Ref. Fig. 001)

The spill door is basically an open structure, the two sides being formed by a sidewall box and a centre wall box, and the trailing edge by a 'D' box; the leading edge is formed by the leading edge of the vane. The vane also fills the space between the three boxes.

At the leading edge, on the sidewall and centre wall boxes, are two hinge assemblies which provide the means of connecting the spill door to the nacelle structure.

The vane is connected to the spill door centre wall and sidewall boxes by hinge assemblies, positioned near to the spill door hinges.

In the box at each side of the spill door, a lever, assembled on the splined end of a vane hinge pin, is connected by a link to one arm of an idler lever; the piston rod of a hydraulic damper is connected to the other side. The body of the damper is attached to a bracket bolted to the structure inside each box.

R

Upstops bolted to the top surfaces of the centre wall and sidewall boxes contact roller assemblies on the nacelle structure when the spill door is closed. The upstops are adjustable, by the use of shims, to align the top skin at the aft end of the 'D' box with the adjoining skin of the intake floor.

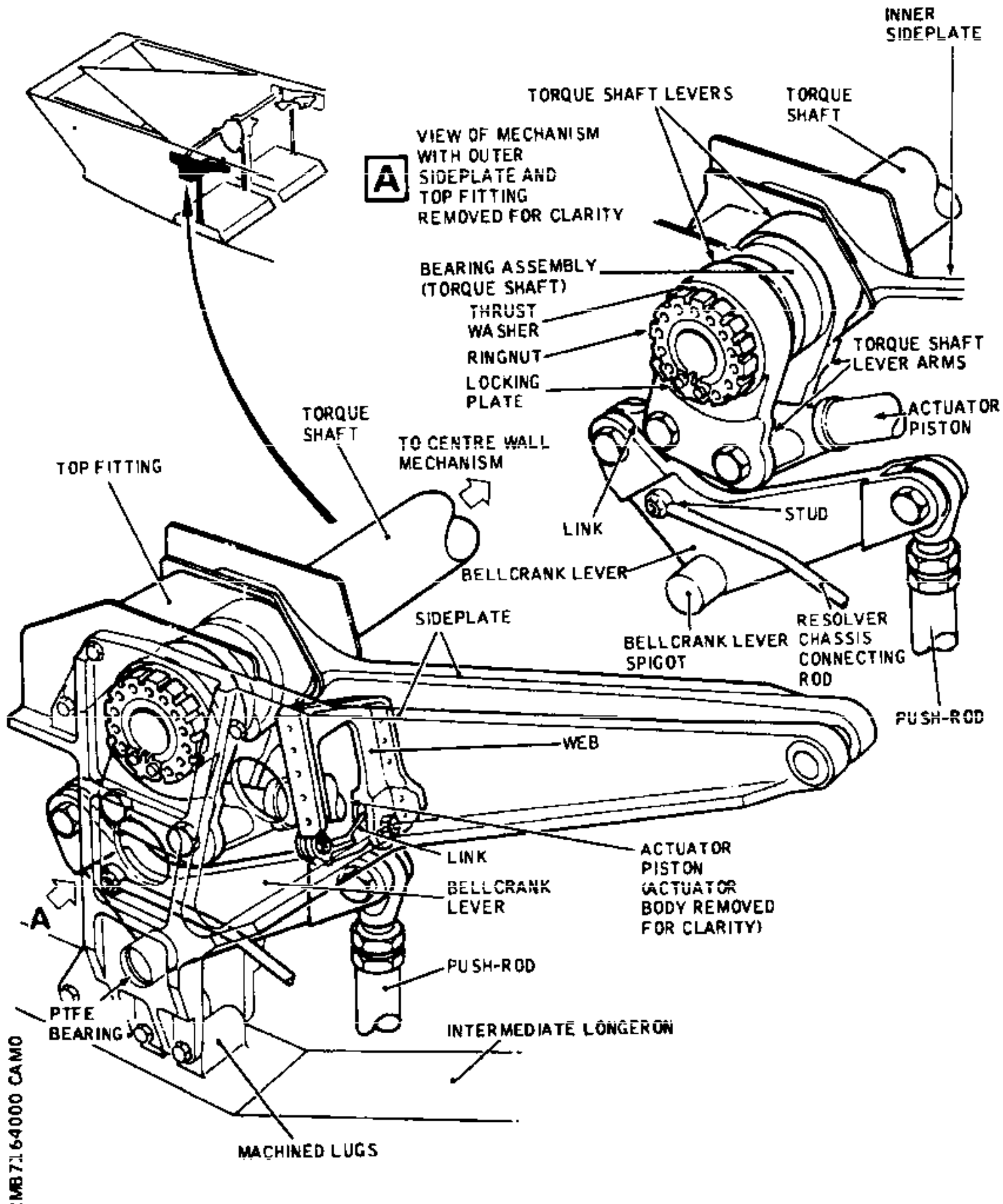
When the spill door is fully closed by hydraulic power, it is pre-loaded against the upstops. This pre-loading prevents the door 'cracking-open' in flight.

3. Actuation Mechanism (Ref. Fig.002 and 003)

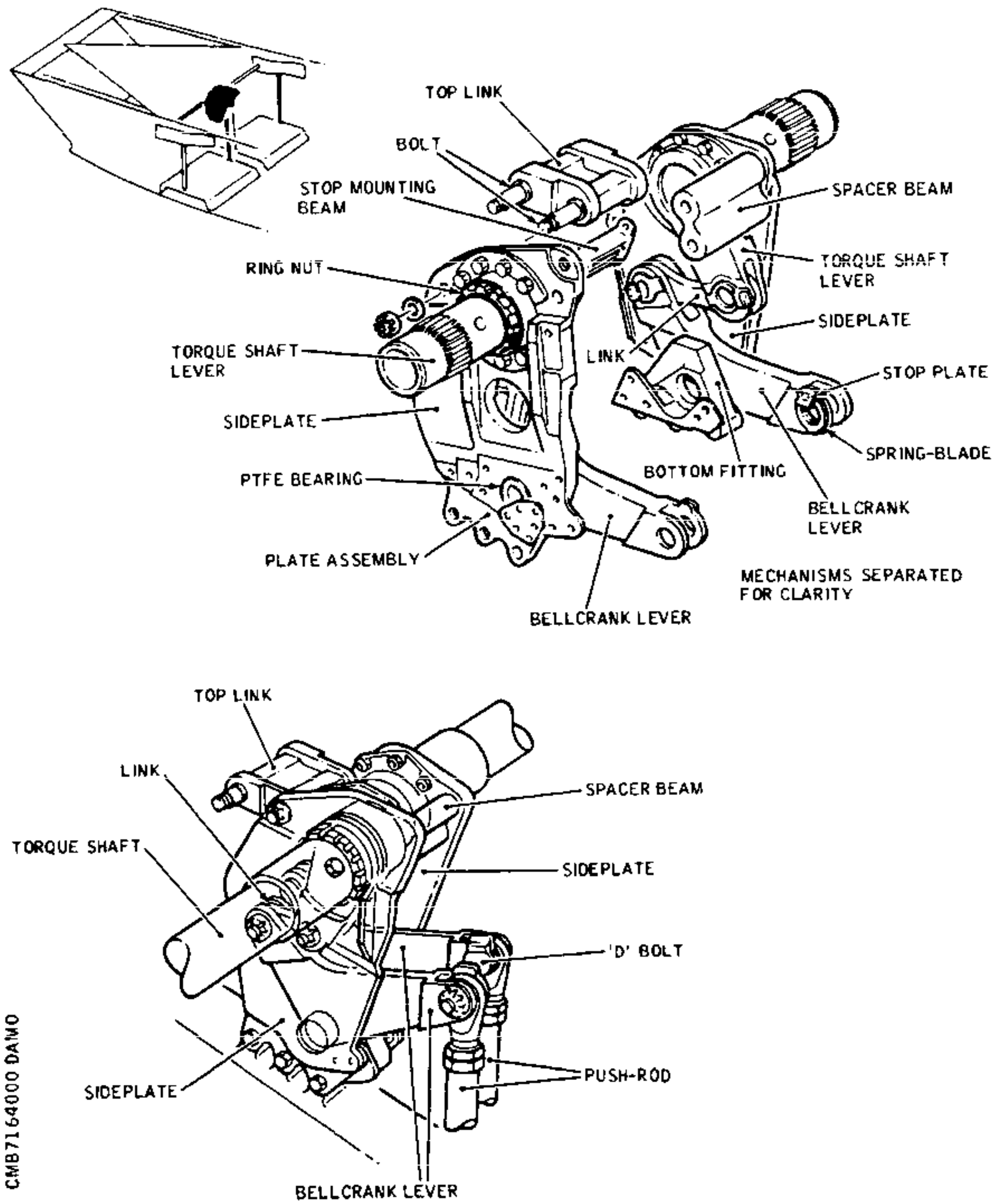
The actuation mechanism comprises a sidewall mechanism in each intake, and a centre wall mechanism which forms part of a dual assembly that includes the independent mechanism for the adjoining intake.

Each sidewall mechanism and its associated centre wall mechanism are interconnected by a torque shaft.

The sidewall mechanism (Ref. Fig. 002) comprises two sideplates bolted at their bottom ends to four machined



Sidewall Actuation Mechanism
Figure 002



Centre Wall Actuation Mechanism
Figure 003

lugs on an intermediate longeron, and bolted at their top ends to a top fitting, which is itself fixed to the nacelle structure. The machined lugs and top fitting also serve as spacers.

The sideplates have extended tapering sections which, part-way along their length, are bolted to a web and link. The web and link also serve as spacers. The link can also be removed to facilitate removal of the actuator.

The ends of the tapered sections have bolt-holes which align with holes in a bracket secured to the structure and form the attachment point for the actuator.

Within the sideplates is the operating mechanism. This includes one end of the torque shaft, housed, but free to rotate, in a bearing assembly. The bearing assembly comprises an outer ring on a spherical ball, both lined with PTFE in their bores. Fitted in the bore of the spherical ball is a sleeve which is free to slide between two swaged retaining rings; this allows the torque shaft to move laterally within the sidewall mechanism. The end of the torque shaft has external splines on which are assembled two torque shaft levers, one each side of the bearing assembly with, on one side, a spacer. The bearing assembly and spacer being between the torque shaft levers, the arms of the levers form a fork with dual attachment points.

A ringnut screwed onto the end of the torque shaft, with a thrust washer between the nut and the associated sideplate, retains the shaft, bearing assembly, spacer and torque shaft levers in position. The ringnut is locked by a locking plate.

The arms of the torque shaft levers (dual attachment fork) have a link secured to one side and the actuator piston to the other. The other end of the link is attached to one end of a bellcrank lever.

The bellcrank lever has a machined spigot on each side. These spigots are positioned in two PTFE-lined bearings, one in each sideplate, and form the pivot for the lever. A stud fitted through the bellcrank lever provides the attachment point for one end of a resolver chassis connecting rod.

A push-rod connects the other end of the bellcrank lever to a bracket on the spill door.

The centre wall mechanism (Ref. Fig. 003) comprises two sideplates bolted at their bottom ends to inner and outer

assemblies positioned each side of a bottom fitting; the whole assembly is bolted to a bracket on an intermediate longeron.

At the top ends, one side of a top link is bolted between the sideplates at the forward position, with the other side of the link bolted to a bracket on the structure. Also, at the forward position below the top link, a stop mounting beam is bolted between the sideplates. A spacer beam is bolted between the sideplates at the aft position. The top link, inner and outer plates and bottom fitting serve as spacers between the sideplates and also provide the attachments to the structure. The stop mounting beam and the spacer beam also serve as spacers.

Within the sideplates are the operating mechanisms of the adjoining intakes. Both mechanisms are similar but, apart from sharing the bottom fitting as a housing for one machined spigot of each bellcrank lever, are in no way interconnected.

Each mechanism comprises a torque shaft lever consisting of an externally splined shaft and an integral forked arm. Each lever is housed, but free to rotate, in a bearing assembly retained within its associated sideplate by a ringnut. The internal splines of each torque shaft mate with the external splines of its associated torque shaft lever. The torque shaft lever arm is attached by a link to one end of the associated bellcrank lever.

The bellcrank lever pivots on spigots in PTFE-lined bearings, one in the bottom fitting, the other in the associated plate assembly. A push-rod connects the bellcrank lever to a bracket on the spill door.

The moving parts of both the centre wall and sidewall mechanisms, except the spigots of the bellcrank levers, have spherical bearings assemblies at the various connecting points.

The bolts used for connecting the moving parts of the sidewall mechanism are hexagonal-headed, but in the centre wall mechanisms, due to the proximity of the moving parts, 'D'-headed bolts are used at the connecting points, with the appropriate bolt-head of each half of the mechanism facing the other.

Stop plates, with spring-blades, are riveted at various positions on the mechanism where the heads of the 'D' bolts are positioned. The stop plates prevent the bolts rotating, while the spring-blades prevent the 'D' bolts moving out

of their holes in certain failure conditions, e.g., failure of lockings and subsequent loosening of nuts, and interfering with the adjoining mechanism.

4. Hydraulic Damper (Ref. Fig. 004)

The hydraulic damper is a fluid-filled piston and cylinder type of unit incorporating a recuperator. Damping action is two-way and is effected by restricting the passage of fluid through a piston head.

A recuperator chamber at one end of the cylinder houses a spring-loaded piston, the space above the piston head being filled with fluid and connected by ducts to a double poppet valve which is, in effect, two non-return valves. These valves are connected respectively by ducts to the inner and outer ends of the damper piston chamber.

A sight glass in the wall of the recuperator chamber enables the fluid content of the damper to be checked by observation of the recuperator piston position, as indicated by two bands, red and green, on the piston skirt.

Moving parts and joints of the damper are sealed against leakage by sealing rings, etc., as necessary.

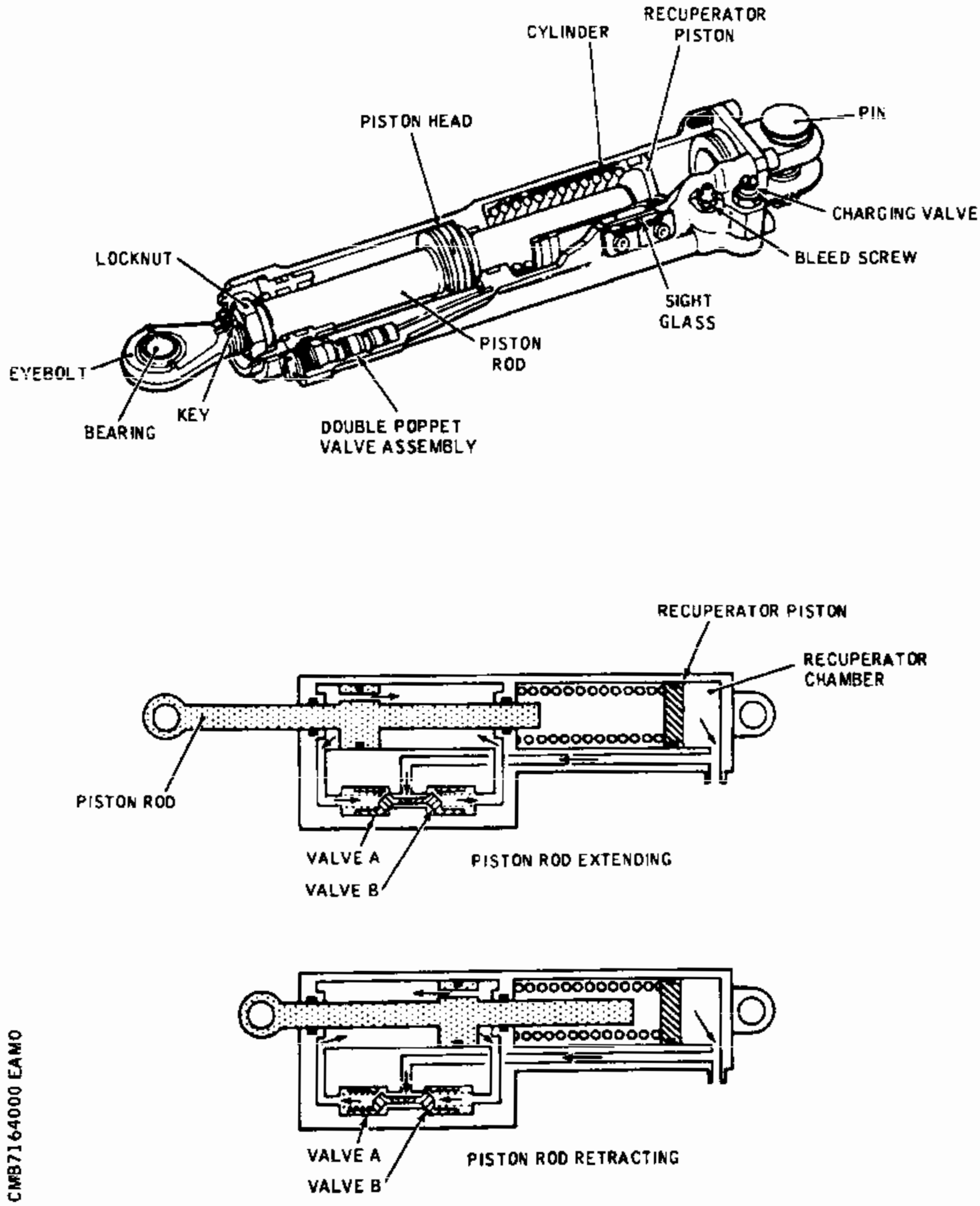
A charging valve and bleed screw are at the outer end of the recuperator chamber, for bench use only, in-situ maintenance not being permitted.

Inward movement of the piston causes fluid to be forced through the orifice in the piston head to the outer end of the chamber; during this action valve B is closed. Outward movement of the piston forces fluid through the orifice in the reverse direction, valve A now being closed.

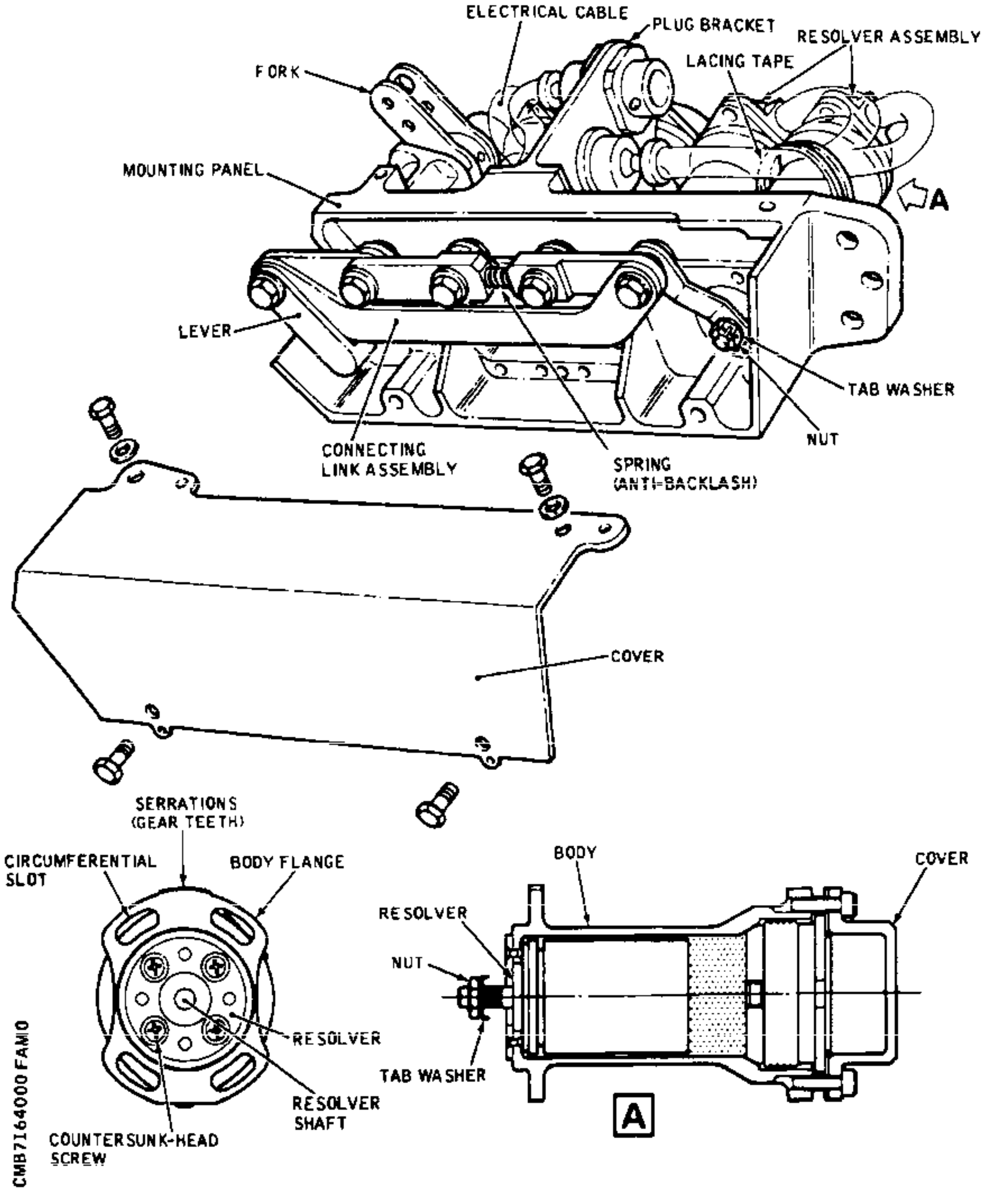
Fluid loss from the damper chamber is made good by fluid, under spring pressure from the recuperator, flowing through the double poppet valve as necessary. The recuperator also accommodates thermally-induced fluid volume changes.

5. Resolver Chassis (Ref. Fig. 005)

The resolver chassis comprises a mounting panel, having on one side four resolver assemblies (in two pairs) and a plug bracket. On the other side, a connecting link assembly interconnects the shafts of the four resolvers. A spring interposed in the connecting link assembly between the two centre resolvers eliminates backlash in the linkage driving the two outer resolvers.



Hydraulic Damper
Figure 004



Resolver Chassis
Figure 005

A fork, connected to a lever and retained by two taper pins, provides the point of connection to a connecting rod, the other end of which is connected to a bellcrank lever of the sidewall actuation mechanism.

Each resolver assembly comprises a body housing at one end a resolver. The resolver is secured to the body by four countersunk-head screws.

The electrical cables from each pair of resolvers terminate in one electrical connector fitted to the plug bracket.

A flange on each resolver body has four circumferential slots (for adjustment purposes) which correspond with four thread inserts in holes in the mounting panel. Socket-head screws secure the resolvers to the mounting panel. Gear teeth on the edge of the body flange are for engagement with a pinion wrench to enable the resolver body to be rotated relative to the mounting panel during adjustment.

All bearings used in the chassis assembly are lined with PTFE.

A detachable cover, secured by four bolts, encloses the connecting link assembly.

Movement of the fork rotates the shafts of the four resolvers simultaneously, modifying the electrical output accordingly.

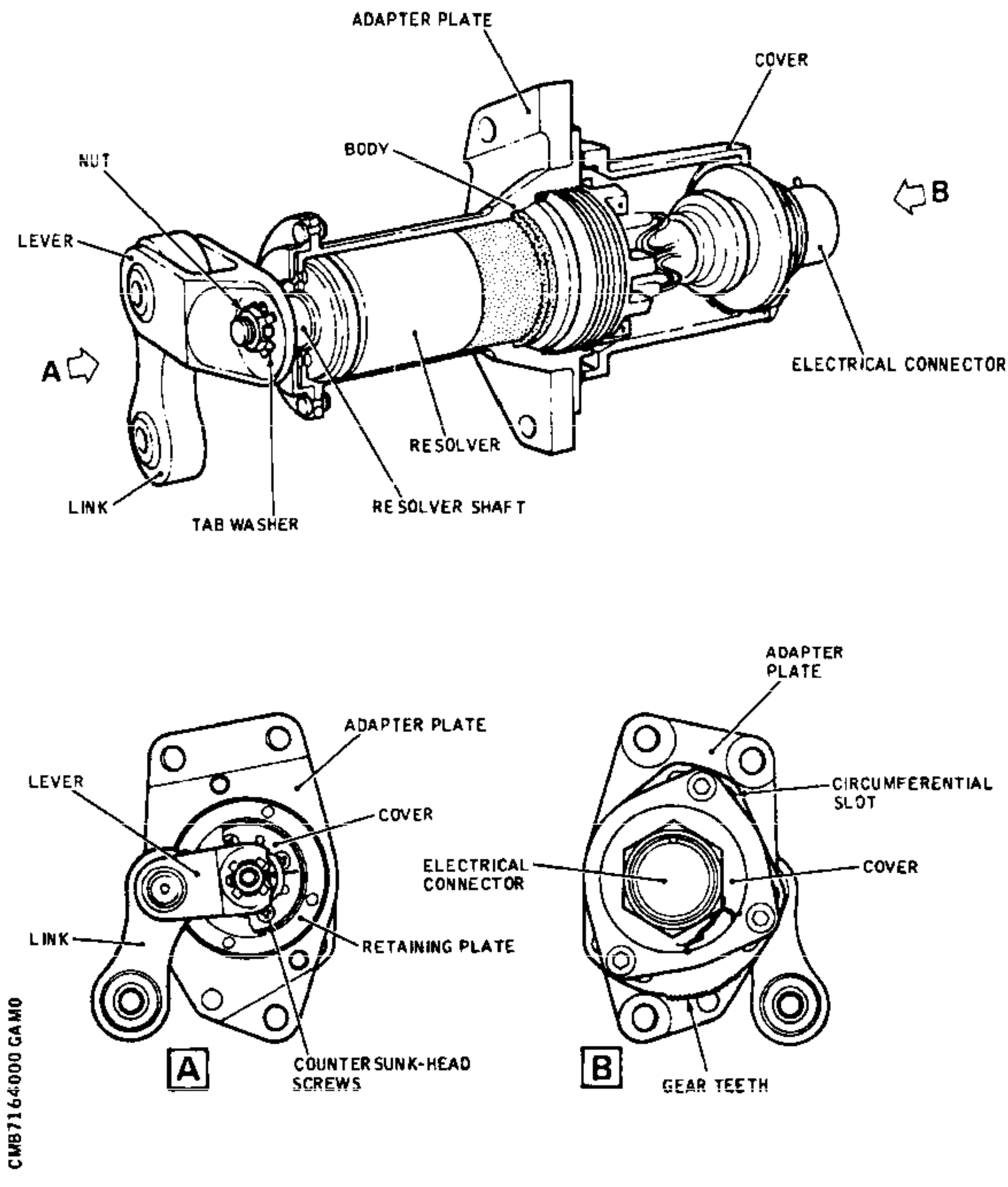
6. Spill Door Position Indicator Resolver (Ref. Fig. 006)

The resolver assembly comprises a resolver housed within a body and cover. Motion of the spill door is transmitted to the resolver by a lever and a link secured to the resolver shaft. The position of the resolver relative to its mounting (adapter plate) is adjustable by a pinion wrench that engages gear teeth on the edge of a flange on the body. Electrical connection is made by a connector on the cover.

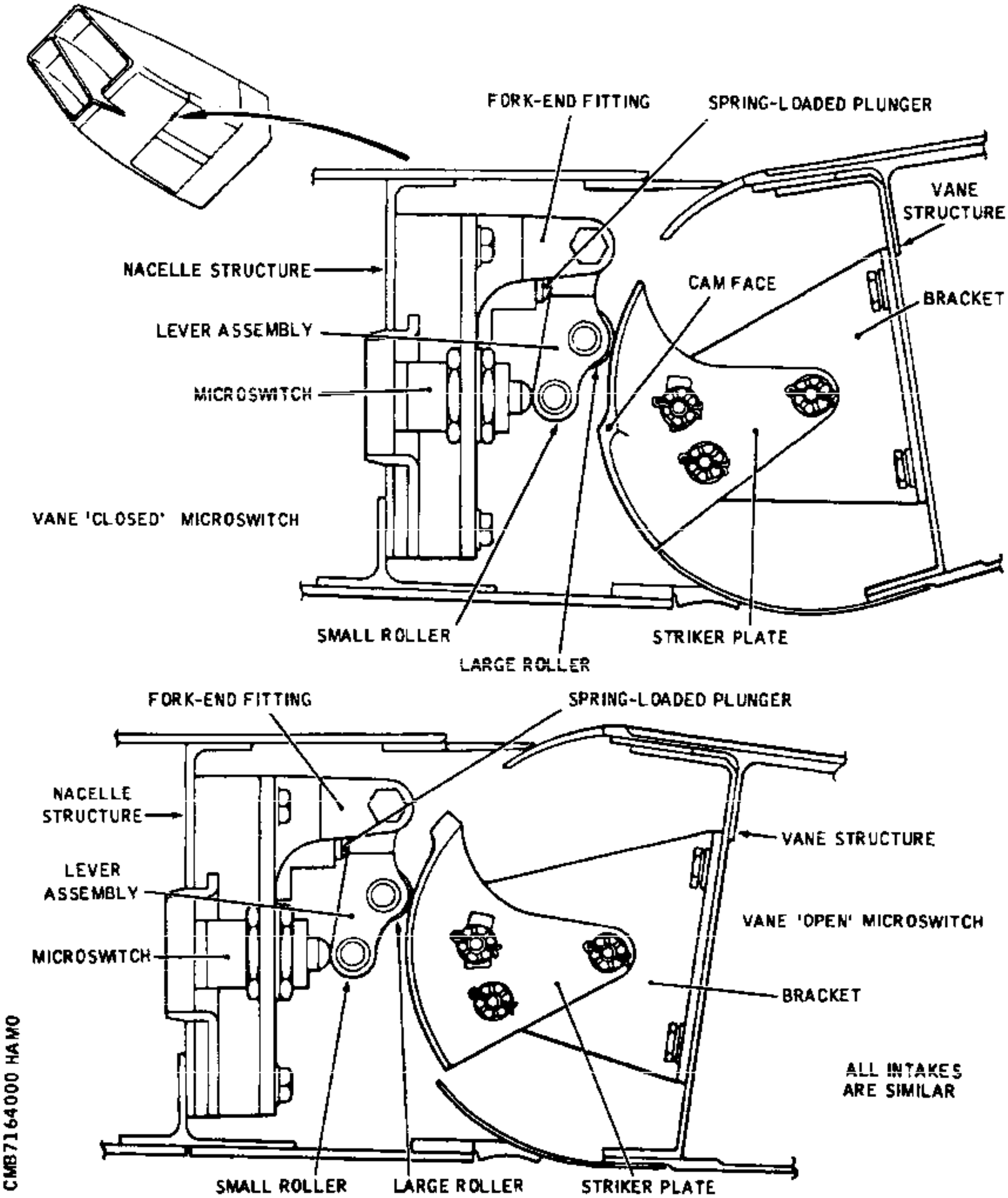
7. Vane Position Indicator Microswitches (Ref. Fig. 007)

Two separate vane position indicator microswitches (one for vane 'open' position, the other for vane 'closed') are housed within fork-end fittings bolted to the nacelle structure of each intake, at the centre of the leading edge of each spill door vane.

Each fork-end fitting, in addition to the microswitch, has a lever assembly comprising a large and a small roller, and is free to pivot on PTFE bearings at its attachment point.



\- Spill Door Position Indicator Resolver
Figure 006



\- Vane Position Indicator Microswitches
Figure 007

Each microswitch is operated by a striker plate, with a cam face on its edge, bolted to a bracket on the vane structure. The large roller of each lever assembly is maintained in contact with its associated striker plate cam face by a spring-loaded plunger.

Opening or closing the vane moves the striker plates. This movement causes the large rollers to engage or disengage the cam lobes; thus the lever assemblies pivot and the small rollers either depress or release the microswitch plungers, depending upon the position of the vane.

8. 'D' Box De-icing Microswitches (Ref. Fig. 008)

The microswitches are housed in a mounting bracket bolted to the top skin of the sidewall box, above the associated idler lever. The microswitches, actuated by an operating mechanism connected to the idler lever, provide control and indication of the de-iced area of the 'D' box.

Opening or closing the vane moves the operating mechanism; this movement causes the lugs on the mechanism to depress or release the plungers of the microswitches, depending upon the position of the vane.

9. Operation

A. Control and Indication

For control and indication, refer to 71-61-00.

B. Functional Description

With hydraulic and electrical power available, operation of a spill door is controlled by electrical signals from the AICS (or from the manual inching facility) that direct hydraulic pressure within the actuator (Ref. 71-62-00), to either extend or retract the actuator piston.

The piston movement is transmitted to the torque shaft levers of the sidewall mechanism and, via the torque shaft, to the torque shaft lever of the centre wall mechanism. The movement is then transmitted to the spill door via the links, bellcrank levers and push-rods.

With the movement of the spill door, associated resolvers for two independent electrical functions are operated, namely, the resolvers on the resolver chassis, which

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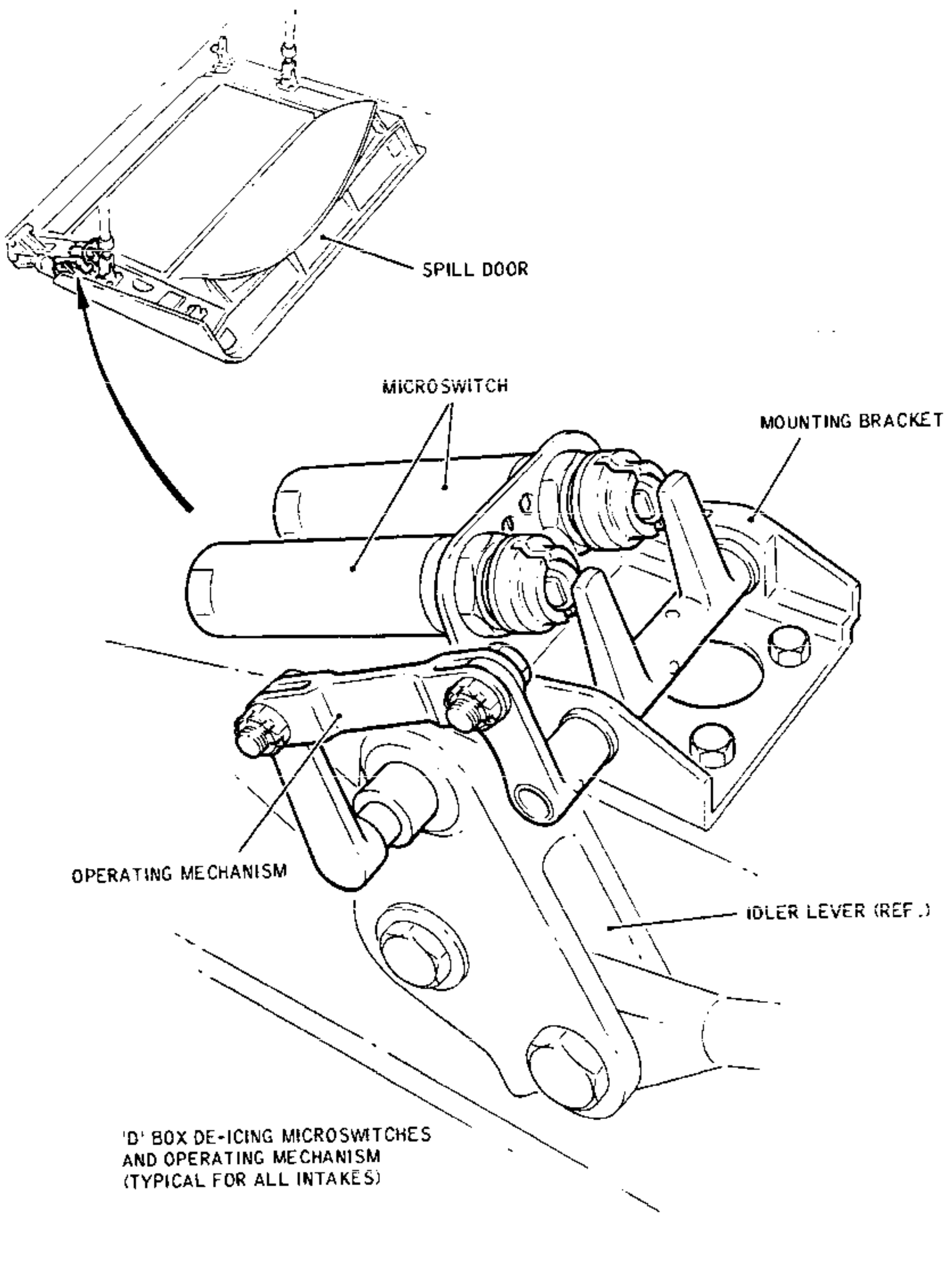

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'D' Box De-icing Microswitches
Figure 008

supply control and monitor signals to the AICS, and the spill door indicator resolver, which supplies signals to a spill door position indicator.

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As previously mentioned, when the spill door opens in flight the differential air pressure on the vane ensures that it moves in accordance with the spill door.

This movement of the vane does not affect the vane position indication system, whose indicator will show the vane as being closed relative to the spill door. This is effected by a long cam lobe on the vane 'closed' striker plate which ensures that the indicator will continue to show the vane as being closed even when the spill door is fully open.

With the spill door shut, the vane is free to open or close independently of the AICS. The vane is aerodynamically operated, and opens to admit extra air to the engine at take-off and low engine speeds. The vane closes when the need for extra air has passed.

SPILL DOOR ACTUATION - SERVICING

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

This topic contains the procedures for operating the spill doors.

The procedures required to open and close the spill doors are almost identical; where differences occur, the instructions to open the door are first mentioned, with the differences required to close the door immediately following, in brackets.

Control and indication is effected at the intake management panel (Ref. 71-61-00) in the flight compartment.

Indication of the spill door position is shown as a percentage (0 per cent, fully closed; 100 per cent, fully opened).

2. Spill Door Manual Control Procedure

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000

DESCRIPTION	PART NO.
Anti-interference plate, for intake management panel	E925068000

B. Prepare

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out in the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) If applicable set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

C. Open (Close) Spill Door

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(1) Ensure that all equipment is clear of moving parts.

(2) Remove the locking pin from the hydraulic selector valve associated with the appropriate spill door and hydraulic system to be used.

(3) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(4) Make available electrical ground power as detailed in 24-41-00.

(5) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(6) At the intake management panel, remove the anti-interference plate. Using the appropriate SPILL switch in an inching mode, move the switch to OPEN (CLOSE) until the door is at the required position. Release the switch.

(7) Depressurize the hydraulic system.

(8) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(9) Trip the circuit breaker reset in operation (3) and fit a safety clip.

(10) Refit, and lock, the anti-interference plate to the intake management panel.

(11) Refit the locking pin removed in operation (2).

D. Conclusion

(1) Fully close the spill door by carrying out operations C.(1) to (11). When carrying out operation C.(6), hold the appropriate SPILL switch at CLOSE until the door is fully closed.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (2), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(2) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(3) Remove the locking pins from the hydraulic selector valves of the four intakes.

(4) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.B.(6) and (7)).

(5) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) Leave the four RAMP/SPILL MASTER switches at the MAN position.

(c) Set the four HYD switches to "AUTO".

(6) Remove the warning placard from the engine start panel.

(7) Remove the barriers from beneath the four spill doors and from the intake entries.

SPILL DOOR ACTUATION - INSPECTION/CHECK

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

IN ADDITION, IT MUST BE ENSURED THAT HYDRAULIC POWER IS NOT APPLIED TO THE APPROPRIATE MAIN (GREEN OR BLUE) SYSTEM AND THE STANDBY (YELLOW) SYSTEM.

1. General

This topic contains the inspection and check procedures for the spill door mechanisms, vane, actuator and vane dampers, under the following headings:

Sidewall Mechanism Backlash Check

Centre Wall Mechanism Backlash Check

Spill Door Pre-load Check

Actuator Operating Rate Check (using AICS inching facility)

Actuator Hydraulic Lock Check

Vane Dampers Oil Content Check

Vane Dampers Damping Action Check

Vane Mechanism Backlash Check

Vane Operation Check

R Wear check on the body of the Spill Door Operating Push-Rods

The procedures apply to all intakes.

2. Sidewall Mechanism Backlash Check (Ref. Fig. 601)

NOTE: If the spill door mechanism has not been re-rigged since the mechanism bearings were new, a spill door pre-load check (Ref. para.4.) may be carried out instead of the following procedure.

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Dial test indicator (DTI)	-

B. Prepare to Check Sidewall Mechanism Backlash

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the areas below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel, at the third crew member's station, to indicate that work is in progress on the intakes.

(4) On the intake management panel (Ref. 71-61-00) proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or

yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

(8) The spill door must be fully open, so, if applicable, proceed as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Remove the locking pin from the hydraulic selector valve associated with the appropriate spill door and hydraulic system to be used.

(b) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

(c) Make available electrical ground power as detailed in 24-41-00.

(d) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(e) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "OPEN" until the spill door is fully open. Release the switch.

(f) Depressurize the hydraulic system.

(g) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(h) Trip the circuit breaker reset in operation (b) and fit a safety clip.

(i) Refit and lock, the anti-interference plate to the intake management panel.

(j) Refit the locking pin removed in operation (a).

(9) Position a dial test indicator (DTI), rigidly supported, in contact with the spill door as near as possible to the trailing edge at the sidewall side of the door, and at an angle of 90 deg (approximately) to the outside skin. Set the DTI to zero.

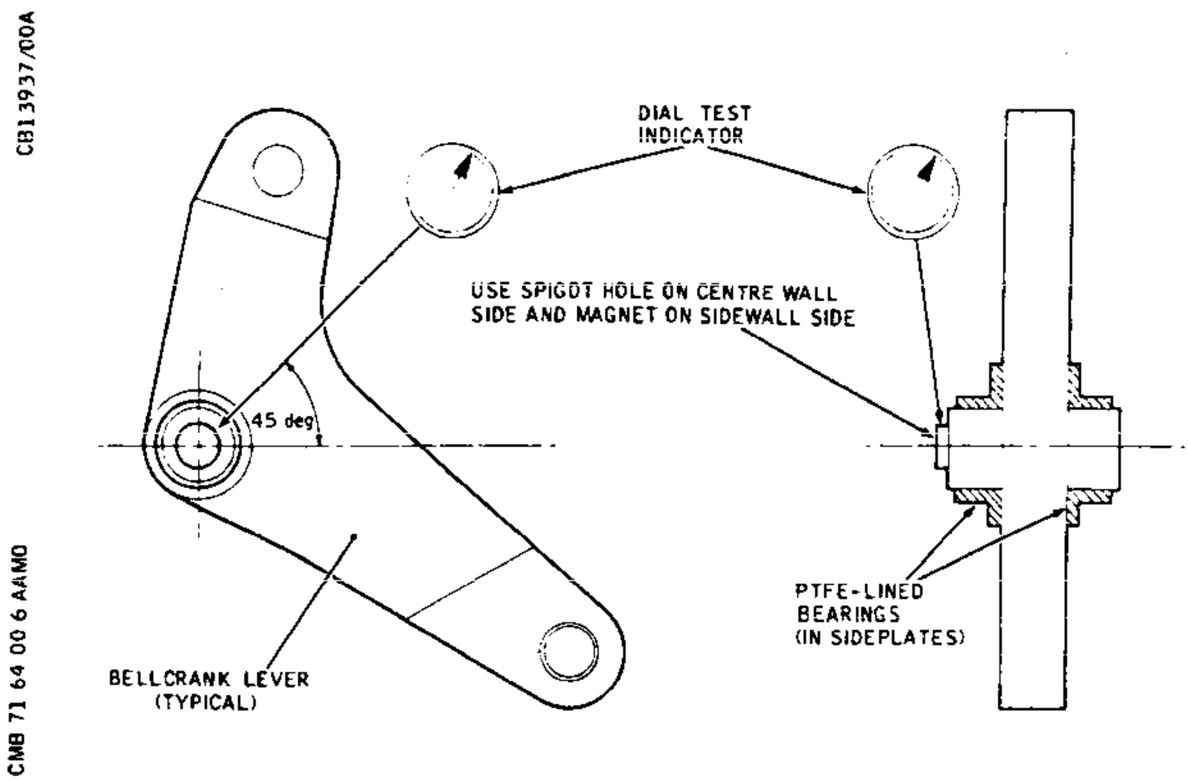
C. Check Sidewall Mechanism Backlash

(1) Manually push upward on the spill door at the sidewall trailing edge, using sufficient force to overcome the weight of the door and to take up any backlash.

(2) Accurately record the DTI reading and then release the door.

(3) If the reading is less than 0.200 in (5.080 mm) the backlash is acceptable, but check the centre wall mechanism backlash (Ref. para.3.).

(4) If the reading is more than 0.200 in (5.080 mm),



Dial Test Indicator - Application
Figure 601

measure the backlash of the bellcrank spigot bearing as follows:

(a) Position a DTI, rigidly supported, on the bell-crank lever in crank lever in position illustrated (Ref. Fig. 601). Set the DTI to zero.

(b) Manually push upward on the spill door at the sidewall trailing edge, using sufficient force to overcome the weight of the door and to take up any backlash.

(c) Accurately record the DTI reading and then release the door.

(5) If the spigot bearing backlash is less than 0.007 in (0.1778 mm) proceed as follows:

(a) Check that the bolts/nuts of the sidewall and centre wall mechanisms are secure and tightened to the required torque values (Ref. 71-64-14, Removal/Installation).

(b) If any bolt/nut required further torque-tightening, recheck the door backlash (Ref. paras.(1) to (4)).

(c) If the door mechanism backlash is still more than 0.200 in (5.080 mm), measure the backlash of all sidewall mechanism bearings. Renew any bearing with a backlash of more than 0.004 in (0.1016 mm) (Ref. 71-64-14), but before removing bearings, check the centre wall mechanism backlash (Ref. para.3.).

(6) If the spigot bearing backlash is greater than 0.007 in (0.1778 mm), proceed as follows:

(a) Measure the backlash of the the bearings in the sidewall mechanism. Renew any bearing with a backlash of more than 0.004 in (0.1016 mm).

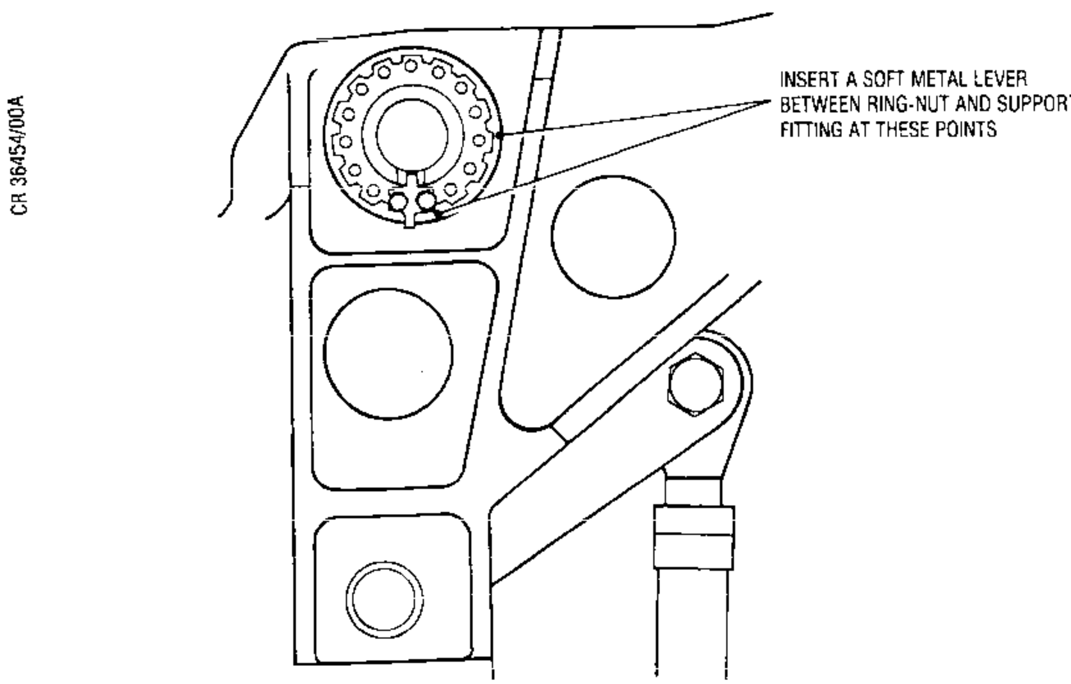
(b) Check the centre wall mechanism backlash (Ref. para.3.), so that if any bearings have to be renewed, the work can be carried out in conjunction with the renewal of bearings in the sidewall mechanism.

(c) Renew the bellcrank lever PTFE-lined bearings, in the sideplates.

(d) Check that the surface finish of each spigot of the bellcrank lever is 4 micro-inches CLA or better.

(e) Recheck the door backlash (Ref. paras.(1) to (4)).

RB (7) Insert a soft metal lever between the ring nut and
RB support fitting (Ref. Fig. 602) and check for bearing
RB wear in two planes. Ensure the support fitting is
RB protected from damage.



Side Wall Bearing Check
Figure 602

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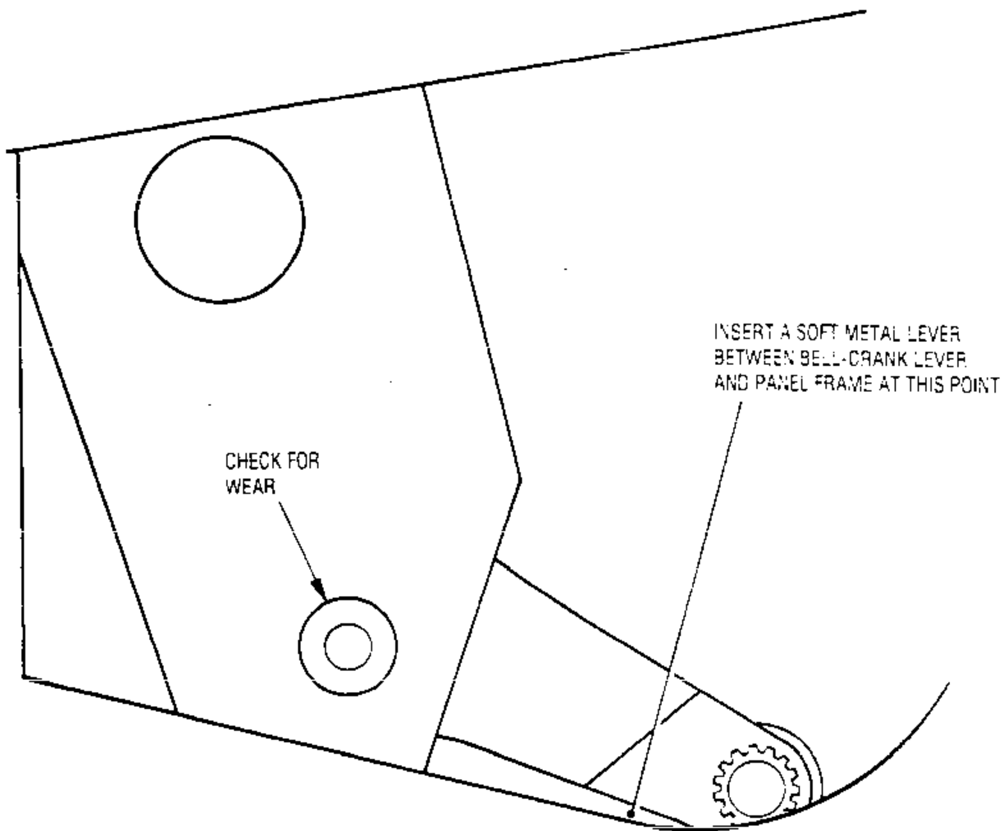


Centre Wall Bearing Wear Check
Figure 603

D. Conclusion

(1) Remove the dial test indicator.

NOTE: If the backlash checks proved to be satisfactory and the mechanism was not disturbed, disregard operation (2) but carry out operations (3) to (9).

(2) Rig the spill doors (if the mechanism was disturbed) in accordance with 71-64-12, Adjustment/Test.

(3) Leave the spill door in the fully closed position.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (4), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDEOM FROM DEBRIS AND LOOSE OBJECTS.

(4) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(5) Remove the locking pins from the hydraulic selector valve of the four intakes.

(6) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.B.(6) and (7)).

(7) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(c) Set the four HYD switches to "AUTO".

(8) Remove the warning placard from the engine start panel.

(9) Remove the barriers from beneath the four spill doors and from the intake entries.

3. Centre Wall Mechanism Backlash Check

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 601.

NOTE: If the spill door mechanism has not been re-rigged since the mechanism bearings were new, a spill door pre-load check (Ref. para.4) may be carried out instead of the following procedure.

A. Equipment and Materials

DESCRIPTION	PART NO.
Dial test indicator (DTI)	-

B. Prepare the Check Centre Wall Mechanism Backlash

(1) Carry out operations 2.B.(1) to (8).

(2) Position a DTI, rigidly supported, on the bellcrank lever in the position illustrated (Ref. Fig.601). Set the DTI to zero.

C. Check Centre Wall Mechanism Backlash

(1) Manually push upward on the spill door at the centre wall trailing edge, using sufficient force to overcome the weight of the door and to take up any backlash.

(2) Accurately record the DTI reading and then release the door.

(3) If the reading taken in operation (2) is less than 0.007 in (0.1778 mm), the backlash of the bellcrank lever bearings is acceptable, and further checks are unnecessary.

(4) If the reading taken in operation (2) is more than 0.007 in (0.1778 mm), proceed as follows:

(a) Measure the backlash of the other bearings in the centre wall mechanism. Renew any bearing with a backlash of more then 0.004 in (0.1016 mm).

(b) Check the sidewall mechanism backlash (Ref. para.2.), so that if any bearings have to be renewed, the work can be carried out in conjunction with the renewal of bearings in the centre wall mechanism.

(c) Renew the bellcrank lever PTFE-lined bearings.

(d) Check that the surface finish of each spigot of the bellcrank lever is 4 micro-inches CLA or better.

R B (5) Insert a soft metal lever between the bellcrank and panel frame (Ref. Fig. 603) and check for bearing wear. Ensure the crank and frame are protected from damage.

R B NOTE: Position DTI as shown in Fig. 601.

D. Conclusion

(1) Remove the dial test indicator.

NOTE: If the backlash checks proved to be satisfactory and the mechanism was not disturbed, disregard operation (2) but carry out operations (3) to (9).

(2) Rig the spill doors (if the mechanism was disturbed) in accordance with 71-64-12, Adjustment/Test.

(3) Leave the spill door in the fully closed position.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (4), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(4) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(5) Remove the locking pins from the hyrdaulic selector valves of the four intakes.

(6) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(7) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(c) Set the four HYD switches to "AUTO".

(8) Remove the warning placard from the engine start panel.

(9) Remove the barriers from beneath the four spill doors and from the intake entries.

4. Spill Door Pre-load Check

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 601.

A. Equipment and Materials

DESCRIPTION	PART NO.
Deflection measuring equipment, for spill door (qty. 2)	E925046000

B. Prepare to Check Spill Door Pre-load

(1) Carry out operations 2.B.(1) to (8).

(2) Attach each deflection measuring equipment to the spill door (one at the sidewall position, the other at the centre wall position), as follows:-

(a) Unscrew the four levelling screws, but do not remove them.

(b) Position the equipment on the door and insert the forward and rear attachment bolts into the anchor nuts in the door.

(c) Tighten both attachment bolts and then unscrew the rear bolt two full turns.

(d) Adjust both front levelling screws and the rear levelling screw next to the vane to draw the equipment away from the door and at the same time level (approximately) the equipment laterally.

(e) Tighten the rear attachment bolt.

(f) Fit the rubber cord assemblies.

(g) Fit a dial test indicator (DTI) at the edge of the equipment nearest to the vane. If possible, position the DTI so that it can be read from outside the door operating area.

(h) Set the DTI to zero.

C. Check Spill Door Pre-load

<u>WARNING:</u> ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(1) Remove the locking pin from the hyrdaulic

selector valve associated with the appropriate spill door and hydraulic system to be used.

(2) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.2.B.(6)).

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(3) Make available electrical ground power as detailed in 24-41-00.

WARNING: AFTER OPERATION (4) THROUGH TO OPERATION (7), HYDRAULIC PRESSURE IS APPLIED CONTINUOUSLY AND THE SPILL DOOR IS CLOSED AND THEN HELD IN THE PRE-LOADED CONDITION UNDER POWER. THROUGHOUT THIS PERIOD, ALL PERSONS MUST BE EXCLUDED FROM THE INTAKE INTERIOR, AND ALSO (EXCEPT FOR THE DTI READER) FROM THE IMMEDIATE VICINITY. ADDITIONALY, THE INTAKE MANAGEMENT PANEL MUST NOT BE LEFT UNGUARDED.

(4) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(5) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "SHUT" until the spill door is fully closed.

NOTE: Any change in the DTI reading whilst the spill door is closing must be ignored.

(6) With the hydraulic system still pressurized and the SPILL switch held at "SHUT", stand clear of the door opening area (i.e., stand at the side of the door, not beneath it) and accurately record the DTI readings. Release the switch.

(7) Switch off and disconnect the hydraulic power supply.

(8) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(9) If the readings taken in operation (6) are more than 0.008 in (0.2032 mm) for the sidewall and more than 0.012 (0.3048 mm) for the centre wall positions, the spill door pre-load is acceptable.

(10) If the readings are less than 0.008 in (0.2032 mm) and 0.012 in (0.3048 mm) for the sidewall and centre wall positions respectively, check, and rectify as necessary, the sidewall and centre wall backlash (Ref. paras.2. and 3. respectively), rig the spill doors and pre-load the push-rods as detailed in 71-64-12, Adjustment/Test.

D. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (1), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(1) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean. Remove the deflection measuring equipment.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(4) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(c) Set the four HYD switches to "AUTO".

(5) Remove the warning placard from the engine start panel.

(6) Remove the barriers from beneath the four spill doors and from the intake entries.

5. Actuator Operating Rate Check

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 601.

A. Equipment and Materials

DESCRIPTION	PART NO.
Stopwatch	-

B. Prepare to Check Operating Rate

(1) Carry out operations 2.B.(1) to (7).

C. Check Operating Rate

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THOSE CIRCUIT BREAKERS RESET IN THE FOLLOWING PROCEDURES.

(1) Ensure that all equipment is clear of moving parts.

(2) Remove the locking pin from the selector valve associated with the main (green or blue) hydraulic system and the actuator being checked.

(3) According to which actuator is being checked, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.2.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Remove the anti-interference plate.

(b) Set the appropriate HYD switch to the main hydraulic system, i.e., "GREEN" or "BLUE".

(5) Make available electrical ground power as detailed in 24-41-00.

(6) Pressurize fully the appropriate main hydraulic

system (Ref. Chap.29), with the application of power controlled by a responsible person associated with the check.

(7) Hold the appropriate SPILL switch at "SHUT" to ensure that the spill door is fully shut. Check that the associated position indicator displays 0 per cent. Release the switch.

(8) Observing the position indicator, simultaneously start the stopwatch and hold the SPILL switch at "OPEN". Check that the time taken for the indicator to display 100 per cent is between 7.3 and 8.2 s. Release the switch.

(9) Observing the position indicator, simultaneously start the stopwatch and hold the SPILL switch at "SHUT". Check that the time taken for the indicator to display 0 per cent is between 10.2 and 11.8 s. Release the switch.

(10) Depressurize the hydraulic system.

(11) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(12) Trip the INT (1, 2, 3 or 4) MAIN HYD SUP circuit breaker, reset in operation (3), and fit a safety clip.

(13) Refit the locking pin, removed in operation (2), to the main system selector valve. Remove the locking pin from the associated standby system selector valve.

(14) Remove the safety clip and reset the appropriate INT (1, 2, 3 or 4) ST'BY HYD SUP circuit breaker (Ref. para.2.B.(6)).

(15) Set the HYD switch to "YELLOW".

(16) Make available electrical ground power as detailed in 24-41-00.

(17) Pressurize fully the standby (yellow) hydraulic system (Ref. Chap.29).

(18) Repeat operations (7) to (11).

(19) Refit the locking pin, removed in operation (13), to the standby system selector valve.

(20) Trip the INT (1, 2, 3 or 4) ST'BY HYD SUP circuit breaker, reset in operation (14), and fit a safety clip.

D. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (1), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(1) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(4) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(c) Set the four HYD switches to "AUTO".

(5) Remove the warning placard from the engine start panel.

(6) Remove the barriers from beneath the four spill doors and from the intake entries.

6. Actuator Hydraulic Lock Check

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 601.

A. Equipment and Materials

DESCRIPTION	PART NO.
Deflection measuring equipment, for spill door	E925046000

B. Prepare to Check Actuator Hydraulic Lock

(1) Carry out operations 2.B.(1) to (8).

(2) Attach the deflection measuring equipment to the sidewall side of the spill door, as follows:-

(a) Unscrew the four levelling screws, but do not remove them.

(b) Position the equipment on the door and insert the forward and rear attachment bolts into the anchor nuts in the door.

(c) Tighten both attachment bolts and then unscrew the rear bolt two full turns.

(d) Adjust both front levelling screws and the rear levelling screw next to the vane to draw the equipment away from the door and at the same time level (approximately) the equipment laterally.

(e) Tighten the rear attachment bolt.

(f) Fit the rubber cord assemblies.

(g) Fit a dial test indicator (DTI) at the edge of the equipment nearest to the vane. If possible, position the DTI so that it can be read from outside the door operating area.

(h) Set the DTI to zero.

C. Check Actuator Hydraulic Lock

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(1) Remove the locking pin from the hydraulic selector valve associated with the appropriate spill door and hydraulic system to be used.

(2) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.2.B.(6)).

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP

(3) Make available electrical ground power as detailed in 24-41-00.

WARNING: AFTER OPERATION (4) THROUGH TO OPERATION (11), HYDRAULIC PRESSURE IS APPLIED ALMOST CONTINUOUSLY AND THE SPILL DOOR IS CLOSED AND THEN HELD IN THE PRE-LOADED CONDITION UNDER POWER. THROUGHOUT THIS PERIOD, ALL PERSONS MUST BE EXCLUDED FROM THE INTAKE INTERIOR, AND ALSO (EXCEPT FOR THE DTI READER) FROM THE IMMEDIATE VICINITY. ADDITIONALLY, THE INTAKE MANAGEMENT PANEL MUST NOT BE LEFT UNGUARDED.

(4) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(5) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "SHUT" until the spill door is fully closed.

NOTE: Any change in the DTI reading whilst the spill door is closing must be ignored.

(6) With the hydraulic system still pressurized and the SPILL switch held at "SHUT", stand clear of the door opening area (i.e., stand at the side of the door, not beneath it) and accurately record the DTI reading. Release the switch.

(7) Switch off the hydraulic power supply.

(8) The reading taken in operation (6) determines what action is required. The possible readings and the necessary actions are as follows:-

(a) If the reading is 0.008 in (0.2032 mm) or more, this is acceptable for the hydraulic lock check. Proceed with operation (9).

(b) If the reading is less than 0.008 in (0.2032 mm), check, and rectify as necessary, the sidewall and centre wall backlash (Ref. paras.2. and 3.), rig the spill door and pre-load the push-rods as detailed in 71-64-12, Adjustment/Test. Then proceed with operation (9).

(9) Switch on the hydraulic power supply.

(10) Hold the SPILL switch at "SHUT" to ensure that the door is preloaded; record the DTI reading. Simultaneously release the SPILL switch and record the time.

(11) Switch off and disconnect the hydraulic power supply.

(12) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(13) Trip the circuit breaker reset in operation (2) and fit a safety clip.

(14) Refit, and lock, the anti-interference plate to the intake management panel.

(15) Refit the locking pin removed in operation (1).

(16) Calculate dimension Y, using the following formula, where X is twice the DTI reading (dimension) recorded in operation (10):-

(0.005 in (0.127 mm) + X) divided by 3 = Y

(17) After 30 min from the time recorded in operation (10), record the DTI reading. If the change in the DTI reading from that recorded in operation (10) is equal to or less than Y, the locking of the jack is acceptable.

(18) If the requirement of operation (17) is not met, renew the actuator as detailed in 71-64-11, Removal/Installation.

D. Conclusion

(1) Remove the deflection measuring equipment from the spill door.

(2) Leave the spill door in the fully closed position.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (3), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(3) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(4) Remove the locking pins from the hydraulic selector valves of the four intakes.

(5) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(6) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(c) Set the four HYD switches to "AUTO".

(7) Remove the warning placard from the engine start panel.

(8) Remove the barriers from beneath the four spill doors and from the intake entries.

7. Vane Dampers Oil Content Check

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 601.

A. Prepare to Check Oil Content

(1) Carry out operations 2.B.(1) to (8), but when carrying out operation (8) open the spill door 50 per cent (18 deg) approximately.

B. Check Oil Content

(1) Look through the two apertures in the top surface of the spill door (one in the sidewall box, the other in the centre wall box), and check the oil content of each damper; it is acceptable if any part of the green sector is visible through the sight glass.

NOTE: In-situ replenishment of oil is not possible, therefore, if the red sector only is visible (i.e., no green) the damper must be renewed (Ref. 71-64-12, Removal/Installation).

(2) Carry out operation 2.B.(8), but fully close the spill door.

C. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (1), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(1) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(4) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(c) Set the four HYD switches to "AUTO".

(5) Remove the warning placard from the engine start panel.

(6) Remove the barriers from beneath the four spill doors and from the intake entries.

8. Vane Dampers Damping Action Check

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 601.

A. Equipment and Materials

DESCRIPTION	PART NO.
Push-pull dial gauge	-

B. Prepare to Check Damping Action

(1) Carry out operations 2.B(1) to (8).

(2) To prevent damage by the push-pull dial gauge, suitably protect the rear edge of the vane on the top and bottom surfaces on the fore-and-aft centre line.

C. Checking Damping Action

WARNING: THIS CHECK REQUIRES THE PERSON USING THE PUSH-PULL DIAL GAUGE TO STAND WITHIN THE SPILL DOOR OPERATING AREA. ENSURE, THEREFORE, THAT HYDRAULIC POWER (IN ADDITION TO THE PRECAUTIONS TAKEN IN OPERATIONS 2.B.(2) TO (7)) IS NOT APPLIED TO THE AIRCRAFT.

NOTE: The following method of checking the vane dampers with the spill door open is specified because it avoids having to enter the intake. The following procedures, however, may be used if the spill door is closed, but the necessary equipment for entering and protecting the intake must be used.

(1) Ensure that the vane is fully closed.

R

R (2) Using the push-pull dial gauge, placed on the vane at an angle of 90 deg (approximately) to the skin, push the vane fully open, following the arc of travel. Check that the load required to just maintain movement of the vane does not exceed 85 lbf (378.10 N).

NOTE: The vane of intake No.4 does not open as far as the vane of intakes 1, 2 and 3.

R (3) Using the push-pull dial gauge, push the vane fully closed. Check that the load required to just maintain movement of the vane does not exceed 35 lbf (155.70 N).

R (4) Remove the protective covering from the vane.

R (5) If applicable, carry out operation 2.B.(8), but fully close the spill door.

D. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (1), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(1) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(4) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(c) Set the four HYD switches to "AUTO".

(5) Remove the warning placard from the engine start panel.

(6) Remove the barriers from beneath the four spill doors and from the intake entries.

9. Vane Mechanism Backlash Check

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 601.

A. Equipment and Materials

DESCRIPTION	PART NO.
Dial test indicator (DTI) and support equipment	-

B. Prepare to Check Vane Mechanism Backlash

(1) Carry out operations 2.B.(1) to (8).

(2) Manually, fully open the vane (i.e., dampers 'bottomed'), and retain the vane in this position.

NOTE: The vane of No.4 intake does not open as far as the other three.

(3) Position a DTI, rigidly supported, on the side-wall of the spill door, with the DTI probe in contact with the vane trailing edge.

(4) Hold the vane fully open (dampers 'bottomed') and set the DTI to zero.

C. Check Vane Mechanism Backlash

(1) Manually, push the vane upward, applying sufficient force to obtain a DTI reading of zero.

(2) Push the vane slowly downward to the point of initial reaction of the dampers.

(3) Note the DTI reading. The reading (backlash) must not exceed 0.551 in (14.0 mm).

(4) Repeat operations (1), (2) and (3) several times to ensure that the point of initial reaction of the dampers is not being passed.

D. Conclusion

(1) Remove the DTI and its associated support equipment.

(2) Manually, fully close the vane.

(3) Repeat operation 2.B.(8), but fully close the spill door.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (4), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(4) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(5) Remove the locking pins from the hydraulic selector valves of the four intakes.

(6) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7).

(7) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(c) Set the four HYD switches to "AUTO".

(8) Remove the warning placard from the engine start panel.

(9) Remove the barriers from beneath the four spill doors and from the intake entries.

10. Vane Operation Check

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 601.

A. Prepare to Check Vane Operation

(1) Carry out operations 2.B.(1) to (8), but when carrying out operation (8) open the spill door 50 per cent (18 deg) approximately.

B. Check Vane Operation

R (1) Manually, fully open the vane, checking throughout
R the operating range that it moves smoothly.

NOTE: The vane of No.4 intake does not open as far as the other three.

(2) Fully close the vane, checking throughout the operating range that it moves smoothly.

C. Conclusion

(1) Carry out operation 2.B.(8), but fully close the spill door.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (2), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(2) Remove all tools and equipment from inside the intake and ensure that the intake interior is clean.

(3) Remove the locking pins from the hydraulic selector valves of the four intakes.

(4) Remove the safety clips and reset the circuit breakers previously tripped (Ref. para. 2.B.(6) and (7)).

(5) On the intake management panel, proceed as follows:

(a) Remove the anti-interference plate.

(b) Set the four RAMP/SPILL MASTER switches to "MAN".

(c) Set the four HYD switches to "AUTO".

(6) Remove the warning placard from the engine start panel.

(7) Remove the barriers from beneath the four spill doors and from the intake entries.

R 11. Wear Check on the Body of the Spill Door Operating Push-Rods

R A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate - for intake management panel	E925068000

R B. To check for wear on the body of the Spill Door Operating Push-Rods

R (1) Preparation.

R This procedure is written for a single intake. All intakes are similar, and the same procedure applies to all intakes. The circuit breakers are listed for all four intakes.

(a) Make sure that the intake is clear of persons and equipment.

(b) Position barriers to prevent persons from inadvertently entering the area below the spill door, and position barriers (e.g. nets) over the intake orifice to prevent persons from entering the intake, particularly when hydraulic power is applied.

(c) Display a warning placard on the engine start panel, at the third crew member's station, to show that there is work in progress on the intake.

(d) On the intake management panel (Ref. 71-61-00) proceed as follows:

- Set the RAMP/SPILL MASTER switch to "MAN".
- Set the appropriate HYD switch to the hydraulic system to be used (i.e. Green, Blue or Yellow).
- Fit, and lock, the anti-interference plate Pt. No. E92506800.

(e) Fit locking pins Pt. No. E925037000 and E925038000 to the main and standby hydraulic selector valves of the intake (Ref. 71-62-00, Servicing).

NOTE: There is one main and one standby hydraulic selector valve in each intake.

(f) For the engine intake you are working on, trip the following circuit breakers and fit safety clips:

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine No.1			
INT 1 MAIN HYD SUP	1-213	1K1950	D 9
AICU 1A SUP	2-213	1K2050	D14
AICU 1A SUP	14-216	1K2051	A 5
INT 1 ST'BY HYD SUP	15-216	1K1960	B 8

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine No.2			
INT 2 ST'BY HYD SUP	1-213	2K1960	E 9
AICU 2A SUP	2-213	2K2051	H14
AICU 2A SUP	13-215	2K2050	A 3
INT 2 MAIN HYD SUP	15-215	2K1960	B18
Engine No.3			
AICU 3A SUP	2-213	3K2050	H13
INT 3 MAIN HYD SUP	5-213	3K1950	A 7
AICU 3A SUP	13-216	3K2051	B 3
INT 3 ST'BY HYD SUP	15-216	3K1960	C18
Engine No.4			
AICU 4A SUP	2-213	4K2051	B14
INT 4 ST'BY HYD SUP	5-213	4K1960	A 6
AICU 4A SUP	14-216	4K2050	B 5
INT 4 MAIN HYD SUP	15-216	4K1950	A 8
Engine Nos. 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	14-216	M 656	A16
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M 626	F22

(g) Trip the following circuit breakers of the appropriate adjoining intake, (i.e. for intake No.1 and 2, or Intake No.3 and 4), and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine No.1			
ENG 1 RH IGNITION CONT	1-213	1J 2	N 6
ENG 1 LH IGNITION CONT	3-213	1J 1	E 1
ENG 1 & 4 AIR START CONT	15-215	K 181	C15

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine No.2			
ENG 2 RH IGNITION CONT	1-213	2J 2	P 6
ENG 2 LH IGNITION CONT	3-213	2J 1	E 2
ENG 2 & 3 AIR START CONT	15-216	K 182	D11
Engine No.3			
ENG 3 RH IGNITION CONT	1-213	3J 2	Q 6
ENG 3 LH IGNITION CONT	3-213	3J 1	E 3
ENG 2 & 3 AIR START CONT	15-216	K 182	D11
Engine No.4			
ENG 4 RH IGNITION CONT	1-213	4J 2	R 6
ENG 4 LH IGNITION CONT	3-213	4J 1	E 4
ENG 1 & 4 AIR START CONT	15-215	K 181	C15

(2) To open the spill door.

(a) The spill door must be fully open to do this inspection. To open the spill door you are working on, do the procedure that follows on the intake you are inspecting:

WARNING: MAKE SURE THAT THE INTERIORS OF ALL INTAKES, SPILL DOORS, OPERATING MECHANISMS, ARE CLEAR OF ALL PERSONS AND EQUIPMENT.

MAKE SURE THAT BARRIERS ARE IN POSITION OVER ALL INTAKE ENTRIES AND ARE BELOW EACH SPILL DOOR.

MAKE SURE THAT ALL LOCKING PINS ARE CORRECTLY FITTED. THESE LOCKING PINS ARE TO REMAIN IN PLACE UNTIL THE REMOVAL OF THE PIN IS REQUIRED TO DO THE INSPECTION. EACH LOCKING PIN IS THEN TO BE FITTED, IN TURN, AS SOON AS THE INSPECTION IS COMPLETE.

MAKE SURE THAT THE CIRCUIT BREAKERS FOR EACH DOOR REMAINS TRIPPED EXCEPT WHEN REQUIRED TO BE IN PLACE FOR EACH INSPECTION.

(b) Remove the locking pin, Part Nos. E925037000 or E925038000, from the hydraulic selector valve for the spill door that is being inspected.

(c) Remove the safety clip from the appropriate circuit breaker and reset the circuit breaker as follows (Ref. para. B.(1)(g)).

NOTE: This will depend on which hydraulic system is in use and on which spill door is being operated.

INT 1, 2, 3 or 4 MAIN HYD SUP, or
INT 1, 2, 3 or 4 ST'BY HYD SUP.

(d) Make sure ground electrical power is available and selected "ON" (Ref. 24-41-00, Servicing).

WARNING: DURING THE CHECKS THAT FOLLOW, THE HYDRAULIC RIG IS TO BE UNDER THE CONTROL OF A RESPONSIBLE PERSON WHO IS WORKING WITH THE SPILL DOOR INSPECTION.

(e) Pressurize the hydraulic system for the spill door that has been selected to be inspected (Ref. 29-00-00, Servicing).

(f) At the third crew member's panel, at the intake management panel:

- Remove the anti-interference plate.
- Operate the appropriate spill door switch.

  Hold the switch at OPEN until the door is confirmed as being fully open.
- Release the spill door switch.
- Re-install and lock the anti-interference plate Pt. No. E925068000.

(g) With the door in the OPEN position, depressurize the hydraulic system (Ref. 29-11-00, Servicing).

(h) Switch off and disconnect the electrical ground power unit (Ref. 24-41-00, Servicing).

(j) Trip the circuit breaker that you set closed in para. (c), for the intake you are working on and re-install the safety clip.

(k) Install the locking pins, Part Nos. E925037000 and E925038000, for the hydraulic selector valves that were removed in para. (b) above.

(3) Inspection.

(a) Inspect the body of the spill door operating push-rods, for wear.

Check, in particular, where there is any contact between the push-rod and the orifice in the intake structure.

NOTE: The maximum wear limit for each rod body is 0.015 inch (0.38 mm).

(b) Repeat the above procedures, as required, for the other intakes that require to have the spill door operating push-rods inspected.

(4) Close-Up.

(a) Close the spill door that has been inspected (Ref. Servicing).

(b) Remove all tools and equipment, including the electrical ground power unit and the hydraulic rig, and ensure that the intake is clear and clean.

(c) Remove the locking pins, Part Nos. E925037000 and E925038000, from the hydraulic selector valve of the intake.

(d) Remove the safety clips and reset the circuit breakers previously tripped.

(e) At the intake management panel of the third crew member's position, proceed as follows:

(1) Unlock and remove the anti-interference plate Pt. No. E925068000.

(2) Select "MAN" on the four RAMP/SPILL MASTER switches.

(3) Set the four HYD switches to "AUTO".

(f) Remove the warning placard from the engine start panel at third crew member's station.

(g) Remove the barriers from beneath the spill doors and from the intake orifices.

SPILL DOOR ACTUATOR - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

An actuator is located within the intake sidewall structure of each intake. Access to each actuator is gained by removal of a panel from the associated intake sidewall, above the spill door.

This topic contains the removal and installation procedures for the actuator as a whole, and those for various parts of the actuator whilst it is installed in the aircraft. The procedures are under the following headings:-

Spill Door Actuator

Servo Valve

Solenoid and Distributor

2. Spill Door Actuator (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Anti-interference plate, for intake management panel	E925068000

DESCRIPTION	PART NO.
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Container, for collecting hydraulic fluid	-
Support, for spill door when fully open	-
Extractor, for jack pin	E925018000
Torque spanner, 25 to 30 lbf in (0.282 to 0.339 mdaN)	-
Torque spanner, 700 to 750 lbf in (7.910 to 8.475 mdaN)	-
Torque spanner, 600 to 1,200 lbf in (6.780 to 13.560 mdaN)	-
Kimwipe tissues, or clean lint-free cloth	-
Locking wire	-
Never-Seez grease	-

B. Prepare to Remove Actuator

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel to indicate that work is being carried out on the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the spill door hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
R AICU 2A SUP	13-216	2K2050	A3
R AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
R AICU 3A SUP	2-213	3K2050	H13
R AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Open the appropriate spill door, as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED,
R EXCEPT THE PIN REMOVED AND THE CIRCUIT
R BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) Remove the locking pin from the hydraulic selector valve associated with the spill door actuator and the hydraulic system being used.

R (c) According to which hydraulic system is to be
R used and which spill door is being operated,
R remove the safety clip and reset the
R appropriate one of the following circuit
R breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(d) Make available electrical ground power as detailed in 24-41-00.

(e) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(f) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "OPEN" until the spill door is fully open. Release the switch.

(g) Depressurize the hydraulic system.

(h) Switch off and disconnect electrical ground power as detailed in 24-41-00.

R (i) Trip the circuit breaker reset in operation
R (c) and fit a safety clip.

(j) Refit the locking pin, removed in operation (b), to the selector valve.

(k) Refit, and lock, the anti-interference plate to the intake management panel.

(8) Position a support beneath the spill door to prevent it opening further when the actuator attachment bolts are removed.

(9) Remove the access panel, 411 HL, 421 HR, 431 HL or 441 HR, from the appropriate intake sidewall.

C. Remove Actuator

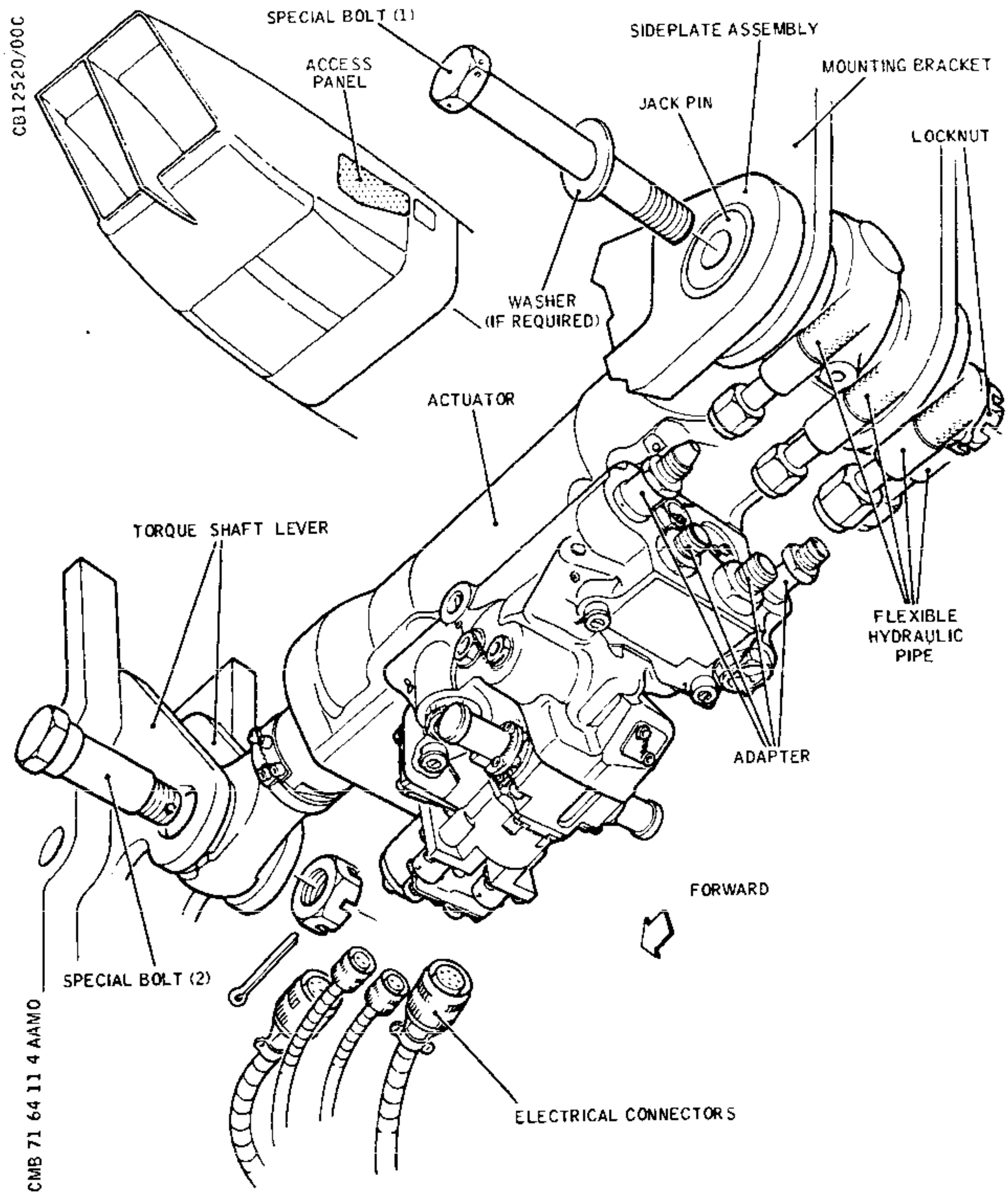
CAUTION: THE CONNECTING ROD IS REMOVED TO PREVENT ITS BEING DAMAGED.

(1) Disconnect and remove the connecting rod from the resolver chassis and the bellcrank lever (Ref. 71-64-13), as follows:-

(a) To ensure that the rod is subsequently positioned correctly, identify one end of the rod with its attaching item (e.g., bellcrank lever).

CAUTION: DO NOT ALTER THE ROD LENGTH.

(b) Remove the split pin, nut, washers and



\- Spill Door Actuator - Installation
Figure 401

R

bolt securing the connecting rod to the resolver chassis.

(c) Remove the split pin, nut and washer securing the connecting rod to the stud on the bellcrank lever.

(d) Disengage and remove the connecting rod from the intake.

(2) Disconnect the electrical connectors from the actuator.

(3) Position the container to collect the residual hydraulic fluid when the flexible pipes are disconnected.

CAUTION: ENSURE THAT ANY 'SET' BENDS ACQUIRED BY THE FLEXIBLE PIPES ARE NOT ALTERED, I.E., DO NOT STRAIGHTEN PIPES.

(4) Disconnect the flexible pipes from the actuator; immediately fit suitable blanks to the pipes and adapters.

(5) Support the actuator.

(6) Remove the locking wire, special bolt (1), washers (if any) and locknut retaining the jack pin.

(7) Remove the split pin, nut and special bolt (2) securing the actuator to the torque shaft levers.

(8) Using the extractor, remove the jack pin.

(9) Disengage and remove the actuator from the aircraft. Place the actuator in a suitable stand.

D. Install Actuator

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

R NOTE: Post SB 71-010 pipes to the actuator can be
R installed only when associated structure cut-outs
R have been enlarged (Ref. SB 71-010).

(1) Ensure that the actuator is in the fully

retracted (spill door open) state.

(2) Ensure that the safety precautions taken in operations B.(2) to (6) have not been cancelled.

(3) Position the actuator body eye-end between the lugs of the mounting bracket; align the holes and insert the jack pin.

CAUTION: DURING THE FOLLOWING OPERATIONS, (4) AND (5), ENSURE THAT THE GREASE DOES NOT CONTACT THE PTFE LININGS OF THE SPHERICAL BEARINGS.

(4) Align the holes in the actuator ram eye-end and the torque shaft levers. Lightly lubricate the special bolt (2) with Never-Seez grease; insert the bolt and fit the nut.

CAUTION: IN OPERATION (5), DO NOT UNSCREW THE NUT IN AN ATTEMPT TO FIT THE SPLIT PIN.

(5) Torque-tighten the nut to 600 lbf in (6.780 mdaN). If the split pin holes are not aligned, i.e., split pin cannot be inserted, progressively increase the torque to a maximum of 1,200 lbf in (13.560 mdaN), checking throughout if the split pin can be inserted. Fit a split pin.

CAUTION: DURING THE FOLLOWING OPERATIONS, (6) AND (7), THE THREADS OF THE SPECIAL BOLT AND LOCKNUT MUST NOT BIND (I.E., BECOME THREAD-BOUND). IT IS PERMISSIBLE TO USE THE MINIMUM THICKNESS OF WASHERS UNDER THE BOLT HEAD (NOT UNDER THE LOCKNUT) TO PREVENT BINDING.

(6) At the actuator body eye-end, position the locknut, with its lug engaged in the indent in the sideplate, and fit the special bolt (1), with the washer (if any) under the bolt head.

CAUTION: AFTER TIGHTENING THE BOLT IN OPERATION (7), ENSURE THAT THE END OF THE BOLT PROTRUDES THROUGH THE LOCKNUT.

(7) Ensure that the locknut lug is still engaged in the indent, and then torque-tighten the special bolt (1) to between 700 and 750 lbf in (7.910 and 8.475 mdaN).

(8) Lock the head of the special bolt (1) to the cleat

on the structure with locking wire in accordance with 20-21-13.

CAUTION: ENSURE THAT THE PIPES ARE CONNECTED WITH ANY ACQUIRED 'SET' BENDS POSITIONED AS NEAR AS POSSIBLE TO THEIR ORIGINAL POSITIONS.

(9) Remove the blanks and connect the flexible pipes to the actuator ports (Ref. Table 401) in accordance with 20-23-11.

(10) Tighten the pipe union nuts, torque-loading them as detailed in Table 401 and in accordance with 20-23-12.

SYSTEM	SERVICE	PORT	TORQUE LOADING
Main	Pressure	A	135 to 145 lbf in (1.525 to 1.638 mdaN)
Main	Return	B	215 to 245 lbf in (2.429 to 2.768 mdaN)
Standby	Pressure	C	135 to 145 lbf in (1.525 to 1.638 mdaN)
Standby	Return	D	215 to 245 lbf in (2.429 to 2.768 mdaN)

NOTE: The port identification letters are marked on the actuator body, near the appropriate adapter.

Flexible Pipe Connections and Torque Loading
Table 401

(11) Remove the container used for collecting hydraulic fluid, and remove any fluid which may have been spilled.

(12) Connect the electrical connectors to the actuator, ensuring that the mating surfaces are clean and undamaged.

(13) Connect the connecting rod to the bellcrank lever and resolver chassis, as follows:-

(a) Position the connecting rod eye-end on the

stud in the bellcrank lever, and fit the washer and nut.

(b) Torque-tighten the nut to between 25 and 30 lbf in (0.282 and 0.339 mdaN). Fit a split pin, bending the legs around the nut, not over the end of the stud.

(c) Check that a gap of 0.118 in (3.0 mm) exists between the end of the stud and the sideplate.

(d) Position the connecting rod eye-end in the resolver chassis fork-end; fit the bolt, washers and nut.

(e) Torque-tighten the nut to between 25 and 30 lbf in (0.282 and 0.339 mdaN) and fit a split pin.

E. Conclusion

(1) Remove the support from beneath the spill door.

(2) Carry out a Functional Test of the actuator as detailed in Adjustment/Test.

3. Servo Valve (Ref. Fig. 402)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

CAUTION: EXTREME CARE MUST BE TAKEN TO ENSURE THAT FOREIGN MATTER IS NOT INTRODUCED INTO THE ACTUATOR.

A. Equipment and Materials

DESCRIPTION	PART NO.
Support, for spill door when closed	-
Container, for collecting hydraulic fluid	-
Torque spanner, 35 to 43 lbf in (0.395 to 0.486 mdaN)	-
R Kimwipe tissues, or clean lint-free cloth	-

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DESCRIPTION	PART NO.
Locking wire	-

B. Prepare to Remove Servo Valve

(1) Carry out the procedures detailed in paragraphs 2.B.(2) to (6) and (9).

(2) Position the support beneath the spill door.

(3) Position the container beneath the servo valve to collect any residual hydraulic fluid.

C. Remove Servo Valve

(1) Disconnect the electrical connectors from the servo valve.

(2) Remove the four bolts securing the servo valve to the electro-hydraulic unit.

(3) Carefully disengage and remove the servo valve.

(4) Remove and discard the four seals and the four anti-extrusion washers.

D. Install Servo Valve

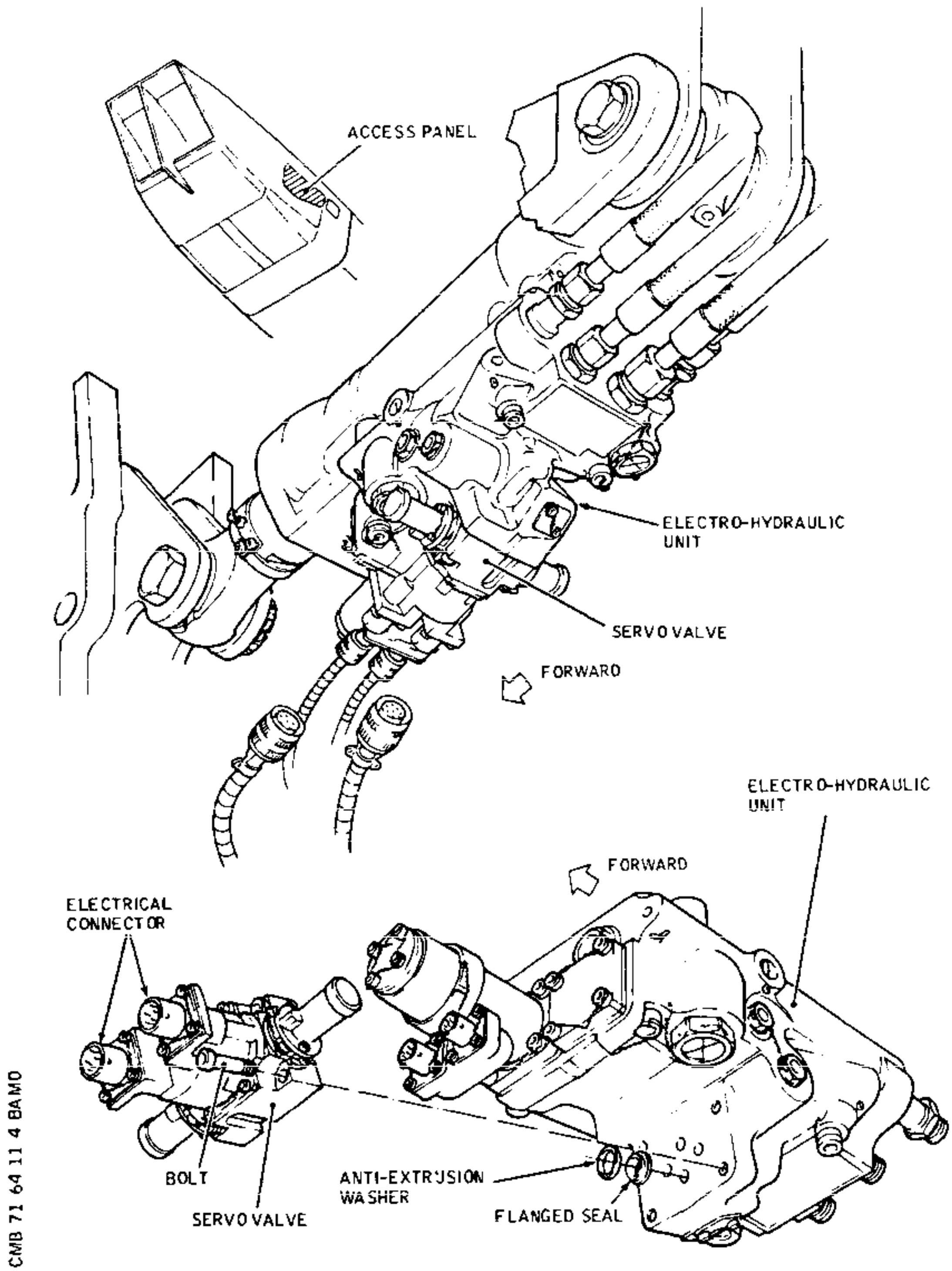
(1) Ensure that the safety precautions taken in operations 2.B.(2) to (6) have not been cancelled.

(2) Position the servo valve, complete with four new seals and four new anti-extrusion washers, on the electro-hydraulic unit and fit the bolts.

(3) Torque-tighten the bolts to between 35 and 43 lbf in (0.395 and 0.486 mdaN).

(4) Interlock the bolts, in pairs, with locking wire in accordance with 20-21-13.

(5) Connect the electrical connectors to the servo valve, ensuring that the mating surfaces are clean and undamaged.



Servo Valve - Installation
Figure 402

E. Conclusion

(1) Remove the container, and remove any hydraulic fluid which may have been spilled.

(2) Remove the support from beneath the spill door.

(3) Carry out a Functional Test as detailed in Adjustment/Test.

4. Solenoid and Distributor (Ref. Fig. 403)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

CAUTION: EXTREME CARE MUST BE TAKEN TO ENSURE THAT FOREIGN MATTER IS NOT INTRODUCED INTO THE ACTUATOR.

A. Equipment and Materials

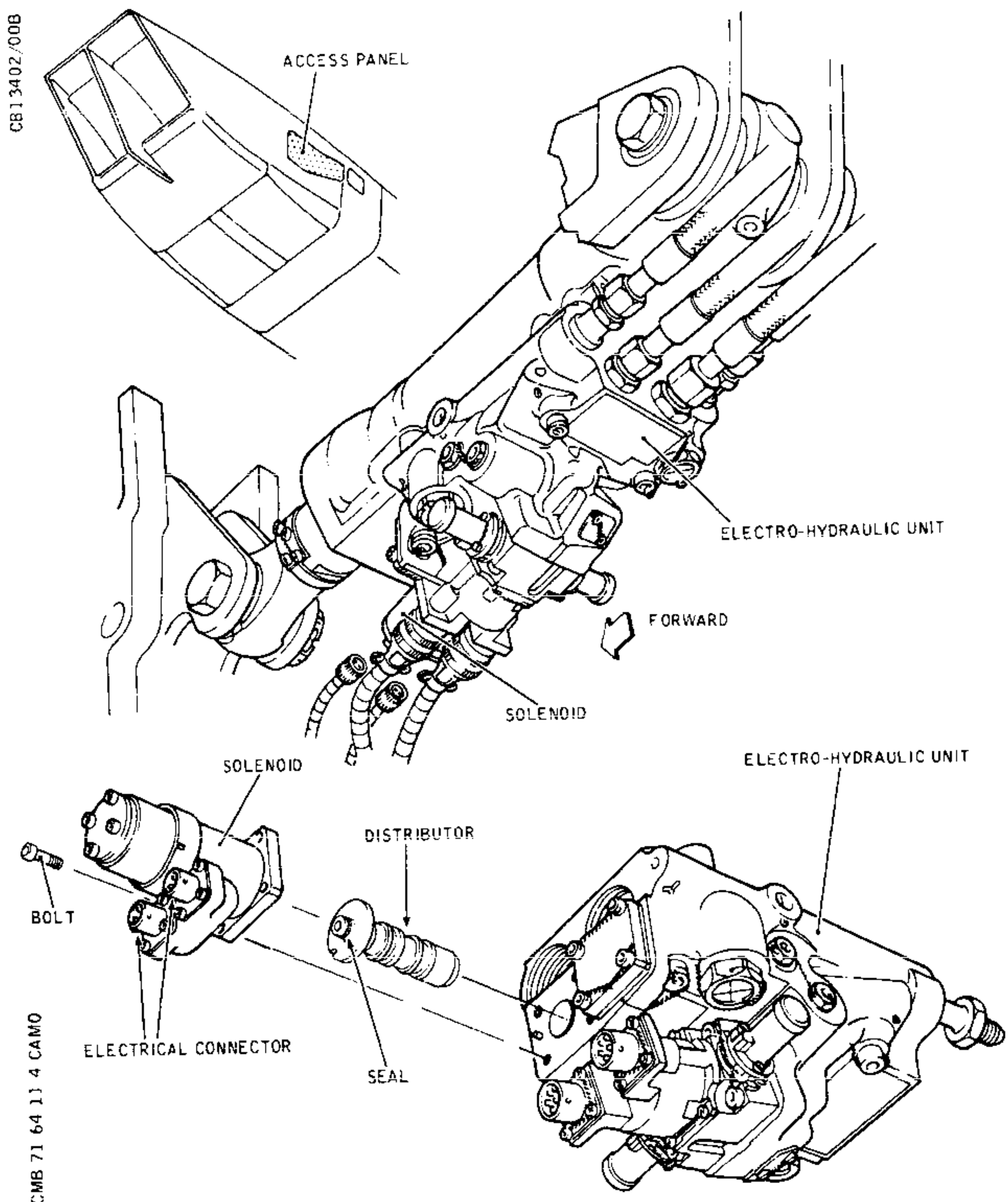
DESCRIPTION	PART NO.
Support, for spill door when closed	-
Container, for collecting hydraulic fluid	-
Torque spanner, 35 to 43 lbf in (0.395 to 0.486 mdaN)	-
Kimwipe tissues, or clean lint-free cloth	
Locking wire	-

B. Prepare to Remove Solenoid and Distributor

(1) Carry out the procedures detailed in paragraphs 2.B.(2) to (6) and (9).

(2) Position the support beneath the spill door.

(3) Position the container beneath the solenoid to collect any residual hydraulic fluid.



R - Solenoid and Distributor - Installation
Figure 403

C. Remove Solenoid and Distributor

CAUTION: ENSURE THAT THE CONNECTING ROD FITTED BETWEEN THE RESOLVER CHASSIS (REF. 71-64-13) AND THE BELLCRANK LEVER IS NOT BENT, OR OTHERWISE DAMAGED, DURING THE FOLLOWING PROCEDURES.

(1) Disconnect the electrical connectors from the solenoid.

(2) Remove the four bolts securing the solenoid to the electro-hydraulic unit.

(3) Carefully disengage and remove the solenoid.

(4) Remove and discard the seal from the distributor.

(5) If required, remove the distributor as follows:-

(a) Carefully withdraw the distributor from the electro-hydraulic unit.

(b) Remove and discard the remaining seals from the distributor.

D. Install Solenoid and Distributor

(1) Ensure that the safety precautions taken in operations 2.B.(2) to (6) have not been cancelled.

(2) If applicable, install the distributor as follows:-

(a) Fit new seals to the distributor.

(b) Lightly lubricate the seals with clean hydraulic fluid.

(c) Align the distributor with the hole in the electro-hydraulic unit, ensuring that the cut-out in the flange is correctly positioned.

(d) Carefully ease the distributor into the electro-hydraulic unit, ensuring that the seals are not damaged.

(3) Position the solenoid, complete with a new seal on the distributor, on the electro-hydraulic unit and fit the bolts.

(4) Torque-tighten the bolts to between 35 and 43 lbf in (0.395 and 0.486 mdaN).

(5) Interlock the bolts, in pairs, with locking wire in accordance with 20-21-13.

(6) Connect the electrical connectors to the solenoid, ensuring that the mating surfaces are clean and undamaged.

E. Conclusion

(1) Remove the container, and remove any hydraulic fluid which may have been spilled.

(2) Remove the support from beneath the spill door.

(3) Carry out a Functional Test as detailed in Adjustment/Test.

5. Electro-hydraulic Unit (Ref. Fig. 404)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

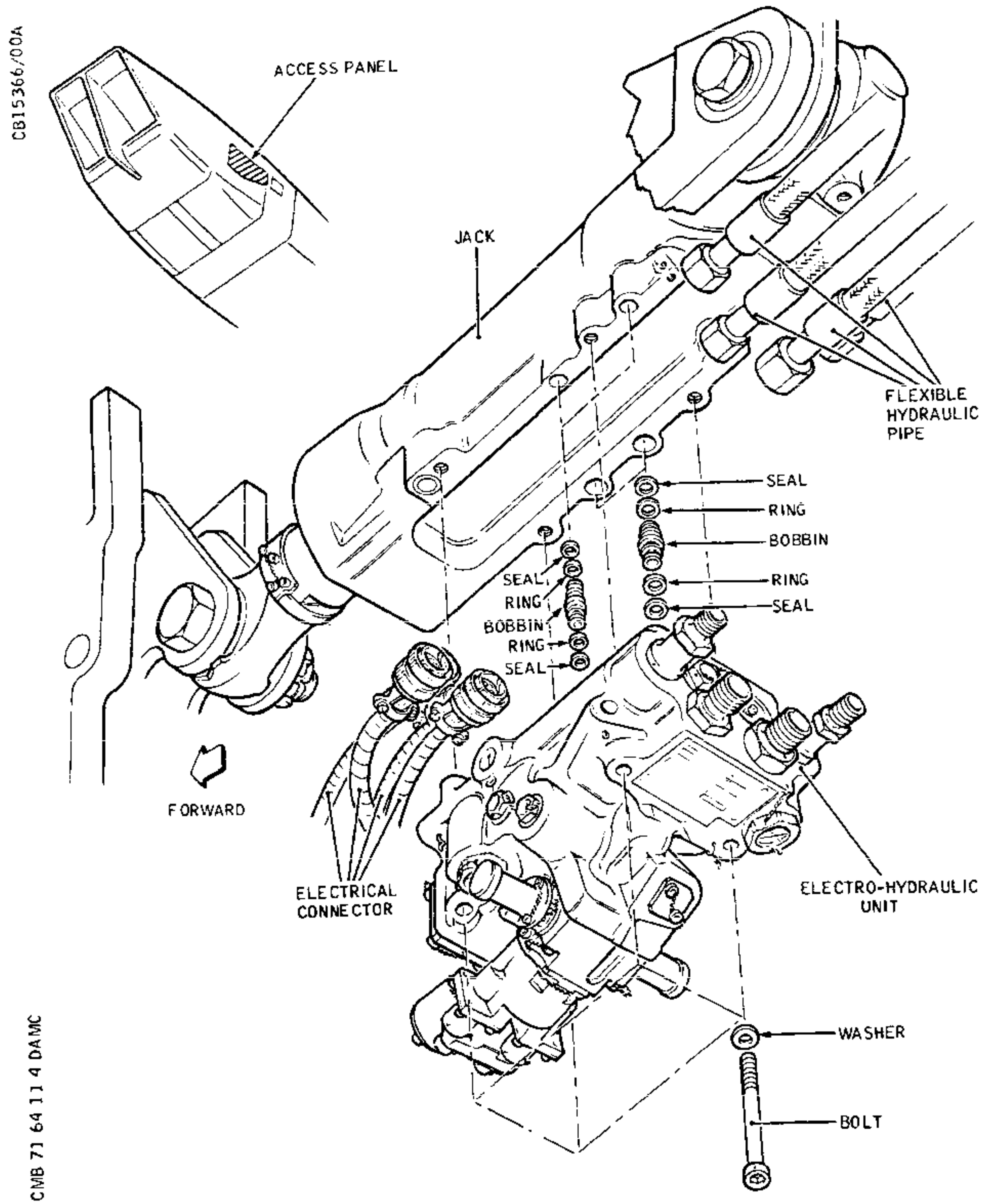
CAUTION: EXTREME CARE MUST BE TAKEN TO ENSURE THAT FOREIGN MATTER IS NOT INTRODUCED INTO THE ACTUATOR.

A. Equipment and Materials

DESCRIPTION	PART NO.
Support, for spill door when closed	-
Container, for collecting hydraulic fluid	-
Torque spanner, 159 to 204 lbf in (1.800 to 2.300 mdaN)	-
Kimwipe tissues, or clean lint-free cloth	-
Locking wire	-

B. Prepare to Remove Electro-hydraulic Unit

(1) Carry out the procedures detailed in paragraphs 2.B.(2) to (6) and (9).



R - Electro-hydraulic Unit - Installation
Figure 404

(2) Position the support beneath the spill door, to prevent it opening when the electro-hydraulic unit is removed.

(3) Position the container to collect the residual hydraulic fluid when the flexible pipes are disconnected and when the electro-hydraulic unit is removed.

C. Remove Electro-hydraulic Unit

CAUTION: ENSURE THAT THE CONNECTING ROD FITTED BETWEEN THE RESOLVER CHASSIS (REF. 71-64-13) AND THE BELLCRANK LEVER IS NOT BENT, OR OTHERWISE DAMAGED, DURING THE FOLLOWING PROCEDURES.

(1) Disconnect the electrical connectors from the unit.

CAUTION: ENSURE THAT ANY 'SET' BENDS ACQUIRED BY THE FLEXIBLE PIPES ARE NOT ALTERED, I.E., DO NOT STRAIGHTEN PIPES.

(2) Disconnect the flexible pipes from the unit; immediately fit suitable blanks to the pipes and adapters.

(3) Support the unit; remove the four bolts securing the unit to the jack.

(4) Carefully disengage, and remove, the unit from the jack.

(5) Remove the bobbins, complete with rings and seals.

(6) Remove the rings and seals from the bobbins; discard the rings and seals.

D. Prepare to Install Electro-hydraulic Unit

(1) Fit new rings and seals to the bobbins.

(2) Lightly lubricate, with clean hydraulic fluid, the rings, seals and the bores of the unit and jack.

(3) Carefully fit the bobbin assemblies into the unit, ensuring that the seals and rings are not damaged.

E. Install Electro-hydraulic Unit

(1) Position the unit on the jack; carefully ease the bobbins into the bores in the jack, ensuring that

the rings and seals are not damaged.

(2) Fit the four bolts and washers; torque-tighten the bolts to between 159 and 204 lbf in (1.800 and 2.300 mdaN). Wire-lock the bolts in accordance with 20-21-13.

CAUTION: ENSURE THAT THE PIPES ARE CONNECTED WITH ANY ACQUIRED 'SET' BENDS POSITIONED AS NEAR AS POSSIBLE TO THEIR ORIGINAL POSITIONS.

(3) Remove the blanks and connect the flexible pipes to the adapters in accordance with 20-23-11.

(4) Tighten the pipe union nuts, torque-loading them as detailed in Table 401 and in accordance with 20-23-12.

(5) Remove the container used for collecting hydraulic fluid, and remove any fluid which may have been spilled.

(6) Connect the electrical connectors to the unit, ensuring that the mating surfaces are clean and undamaged.

F. Conclusion

(1) Remove the support from beneath the spill door.

(2) Carry out a Functional Test as detailed in Adjustment/Test.

SPILL DOOR ACTUATOR - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

This Functional Test confirms that the actuator is operating correctly in accordance with the applied electrical signals and hydraulic power supply, and also that the actuator opens and closes the spill door within specified times.

R The Test is in two parts, one using a test set, the other
R using the air intake control system (AICS) inching facility.

R It is not necessary to perform the part of the Test using the
R test set if it is known that the rate of operation of the
R actuator with a 4 mA current input to the servo valve is
R satisfactory.

R The part using the AICS inching facility must be carried out
R to check the integrity of the electrical system, whether or
R not the test set is used.

When the test set is used, control is effected by the test set, with indication at the air intake management panel (Ref. 71-61-00).

R When the AICS inching facility is used, control and indication of the spill door movement is effected at the air intake management panel. The person controlling the actuator must remain at the panel (to prevent inadvertent operation) whenever the anti-interference plate is not fitted.

In the interest of safety, all persons not connected with the test must be excluded from the areas around the four

intakes.

Operational Test requirements are satisfied by the Test carried out in 71-61-00, Adjustment/Test. A System Test is not applicable in this instance.

2. Functional Test

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Test set, for operating actuator R (includes power loom R Pt. No.TE6043203 and spill loom R Pt. No.TE6043202)	TE6043000
Stopwatch	-
Angle indicator	D920327000

B. Prepare to Test

(1) Ensure that the four intakes are clear of personnel and equipment.

(2) Position barriers to prevent persons from inadvertently entering the areas below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel to indicate that work is being carried out on the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the main system, i.e., "GREEN" or "BLUE".

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the spill door hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) If applicable, remove the access panel, 411 HL, 421 HR, 431 HL, or 441 HR, from the sidewall of the appropriate intake.

(8) Attach one end of the angle indicator to the spill door, as near as possible to the trailing edge and on a fore-and-aft line at the centre wall position. Attach the other end of the indicator to the intake structure.

C. Test Using Test Set

NOTE: This part of the Test may be disregarded if the rate of operation of the actuator with a 4 mA current input to the servo valve is known to be satisfactory.

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED.

ALL LOCKING PINS MUST REMAIN FITTED, EXCEPT THE PINS REMOVED IN THE FOLLOWING PROCEDURES.

(1) Ensure that all equipment is clear of moving parts.

(2) Carry out an operation and rate check of the actuator, as follows:-

(a) Disconnect the electrical connectors from the actuator.

(b) Disconnect the electrical connectors from the main and standby hydraulic selector valves associated with the actuator.

R (c) Connect the single end of the spill loom to the
R connector PL1 on the test set and connect the
R six tails to their servo and selector valves
R in accordance with the identification label on
R each tail.

(d) Remove the locking pin from the main system selector valve.

(e) Set the switches on the test set as follows:-

e1) MAIN DRIVE - ALT DRIVE to "MAIN DRIVE".

e2) UP - DOWN to centre (off).

R e3) HYDRAULIC SELECTION MAIN - STANDBY to
R "MAIN".

e4) OFF - LOCK TEST to "OFF".

e5) ON - OFF to "OFF".

R (f) Using the power loom, connect an electrical
R 28 V d.c. supply to the test set connector PL2
R and set the ON - OFF switch to "ON".
R Check that the following lamps are lit:-

f1) 28 V SUPPLY.

f2) SYSTEM CONNECTED - SPILL.

(g) Adjust the test set to produce a 4 mA current supply to the servo valve.

(h) Pressurize fully the main hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with the test.

(i) Press and hold the ENERGIZE switch; check that the HYDRAULIC SELECTION - MAIN lamp is lit. With the ENERGIZE switch held pressed, hold the UP - DOWN switch at ""UP" to ensure that the spill door is fully closed (0 per

cent indicated). Set the switch to the centre (off) position.

(j) Press and hold the ENERGIZE switch. Simultaneously start the stopwatch and hold the UP - DOWN switch at "DOWN". Check that the time taken for the spill door to open to
R 37(±0.7) deg for intake 2 or 3, or
R 36.3(±0.7) deg for intake 1 or 4 (100 per cent
R indicated) is between 2.0 and 3.5 s. Set the
R UP - DOWN switch to the centre (off) position
R and release the ENERGIZE switch.

(k) Press and hold the ENERGIZE switch. Simultaneously start the stopwatch and hold the UP - DOWN switch at "UP". Check that the time taken for the spill door to shut fully (0 per cent indicated) is between 1.5 and 2.5 s. Set the UP - DOWN switch to the centre (off) position and release the ENERGIZE switch.

(l) Set the MAIN DRIVE - ALT DRIVE switch to "ALT DRIVE".

(m) Repeat operations (j) and (k).

(n) Depressurize the main hydraulic system.

(o) Refit the locking pin to the main system selector valve. Remove the locking pin from the standby system selector valve.

R (p) Set the HYDRAULIC SELECTION MAIN - STANDBY switch to "STANDBY".

(q) Pressurize fully the standby hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with the test.

(r) Press and hold the ENERGIZE switch; check that the HYDRAULIC SELECTION - STANDBY lamp is lit and the MAIN lamp is out. Repeat operations (j) and (k).

(s) Set the MAIN DRIVE - ALT DRIVE switch to "MAIN DRIVE".

(t) Repeat operations (j) and (k).

(u) Depressurize the standby hydraulic system.

(v) Switch off and disconnect the electrical power supply to the test set.

(w) Refit the locking pin to the standby system selector valve.

R (x) Switch off the test set and then disconnect
R the test set looms from the actuator and
R from both selector valves.

(y) Connect the electrical connectors to the actuator and selector valves, ensuring that the mating surfaces are clean and undamaged.

(z) Carry out an operation and rate check, using the AICS inching facility (Ref. para.(D)).

D. Test Using AICS Inching Facility

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE PINS REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(1) Ensure that all equipment is clear of moving parts.

(2) Carry out an operation and rate check as follows:-

(a) Remove the locking pin from the main system spill door hydraulic selector valve associated with the actuator being tested.

(b) According to which actuator is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP.

(c) Make available electrical ground power as detailed in 24-41-00.

CAUTION: THE PERSON RESPONSIBLE FOR CONTROLLING THE TEST MUST ENSURE THAT THE INTAKE MANAGEMENT PANEL IS NOT LEFT UNGUARDED UNTIL THE TEST IS CONCLUDED.

(d) Remove the anti-interference plate from the intake management panel.

(e) Pressurize fully the appropriate main hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with the test.

(f) Hold the appropriate SPILL switch at "SHUT" until the spill door is fully shut. Check that the position indicator displays 0 per cent. Release the switch.

(g) Observing the position indicator, simultaneously start the stopwatch and hold the SPILL switch at "OPEN". Check that the time taken for the indicator to display 100 per cent, and for the
R spill door to open to 37(±0.7) deg for intake
R 2 or 3, or 36.3(±0.7) deg for intake 1 or 4 is between 7.3 and 8.2 s. Check that the spill door moves smoothly throughout its travel. Release the switch.

(h) Simultaneously start the stopwatch and hold the SPILL switch at "SHUT". Check that the time taken for the indicator to display 0 per cent, and for the spill door to shut fully, is between 10.2 and 11.8 s. Check that the spill door moves smoothly throughout its travel. Release the switch.

(i) Depressurize the main hydraulic system.

(j) Fit the locking pin, removed in operation (a), to the main system hydraulic selector valve.

(k) Trip the INT (1, 2, 3 or 4) MAIN HYD SUP circuit breaker reset in operation (b) and fit a safety clip.

(l) Check the actuator and associated pipes for hydraulic fluid leakage.

(m) Remove the safety clip and reset the appropriate INT (1, 2, 3 or 4) ST'BY HYD SUP circuit breaker (Ref. para.B.(6)).

(n) Remove the locking pin from the standby system hydraulic selector valve associated with the actuator under test.

(o) On the intake management panel, set the appropriate HYD switch to "YELLOW".

(p) Pressurize fully the standby hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with the test.

(q) Hold the appropriate SPILL switch at "SHUT" until the spill door is fully shut. Check that the position indicator displays 0 per cent. Release the switch.

(r) Observing the position indicator, simultaneously start the stopwatch and hold the SPILL switch at "OPEN". Check that the time taken for the indicator to display 100 per cent and for the
R spill door to open to 37(±0.7) deg for intake 2
R or 3, or 36(±0.7) deg for intake 1 or 4 is between 7.3 and 8.2 s. Check that the spill door moves smoothly throughout its travel. Release the switch.

(s) Simultaneously start the stopwatch and hold the SPILL switch at "SHUT". Check that the time taken for the indicator to display 0 per cent and for the spill door to shut fully, is between 10.2 and 11.8 s. Check that the spill door moves smoothly throughout its travel. Release the switch.

(t) Depressurize the standby hydraulic system.

(u) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(v) Fit the locking pin, removed in operation (n), to the standby system hydraulic selector valve.

(w) Check the actuator and associated pipes for fluid leakage.

E. Conclusion

(1) Remove the angle indicator.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT, THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(2) Remove all tools and equipment from the inside the

intake, and ensure that the intake is clean.

(3) Remove the locking pins from the hydraulic selector valves of the four intakes.

(4) At the intake management panel, proceed as follows:

(a) If applicable, remove the anti-interference plate.

(b) Set the four HYD switches to "AUTO".

(c) Leave the four RAMP/SPILL MASTER switches at the MAN position.

(5) Remove the safety clips and reset the circuit breakers previously tripped (Ref. para.B.(6)).

(6) Remove the warning placard from the engine start panel.

(7) Refit the access panels previously removed.

(8) Remove the barriers from the four intake entries, and from beneath the spill doors.

(9) Carry out the appropriate Preliminary Test as detailed in 71-61-00, Adjustment/Test, '3. Operational Test (Excluding Ramp Manual Inching, Spill Door Manual Inching and Auxiliary Inlets'.

SPILL DOOR - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 and 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

R IN ADDITION, IT MUST BE ENSURED THAT HYDRAULIC POWER
R IS NOT APPLIED TO THE APPROPRIATE MAIN (GREEN OR BLUE)
R SYSTEM AND THE STANDBY (YELLOW) SYSTEM.

1. General

This topic contains the removal and installation procedures for the spill door and associated components under the following headings:-

Spill Door

Vane

Damper

'D' Box De-icing Microswitches and Mounting Bracket

Any spill door can be removed and installed independently.

The vane, dampers, microswitches and mounting bracket can be removed and installed with the spill door either connected to, or disconnected from, the intake.

Throughout these procedures, care must be taken to avoid damage to the de-icing mat on the curved surface of the spill door 'D' box.

2. Spill Door

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Anti-interference plate, for intake management panel	E925068000
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Protective cover, for intake lip	D926806000
Servicing extension (spring-board)	-
Work stand	-
Crawling board	-
Cover, for engine transition ring	D935036001
Torque spanner, 12 to 14 lbf in (0.136 to 0.158 mdaN)	Ultra-W8808-6UNC
Torque spanner, 30 to 40 lbf in (0.339 to 0.452 mdaN)	-
Torque spanner, 60 to 70 lbf in (0.678 to 0.791 mdaN)	-
Torque spanner, 300 to 650 lbf in (3.390 to 7.345 mdaN)	-
Torque spanner, 600 to 1,200 lbf in (6.780 to 13.560 mdaN)	-
R Door handling equipment	E935045002
Alignment tools, for push-rod eye-end and fork-end	E925059000
Support, for spill door when fully open	-

DESCRIPTION	PART NO.
Support, for spill door when 18 deg (approximately) open	-
Support, for spill door when fully closed	-
R Mini-lift, 5 cwt (254 kg), R fitted with 36 in (915 mm) extension	-

B. Prepare to Remove Spill Door

(1) Ensure that the four intakes are clear of personnel and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out in the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the hydraulic system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate to the intake management panel.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
INT 1 IND SUP	5-213	1E531	C6
LH CYCLIC TIMER CONT	3-213	1H1835	B11
WINGS & INTS NORM CONT	15-215	1H1836	D10
WINGS & INTS ALT CONT	15-216	2H1836	E14
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
INT 2 IND SUP	5-213	2E531	C7
LH CYCLIC TIMER CONT	3-213	1H1835	B11
WINGS & INTS NORM CONT	15-215	1H1836	D10
WINGS & INTS ALT CONT	15-216	2H1836	E14
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
INT 3 IND SUP	1-213	3E531	G9
RH CYCLIC TIMER CONT	15-216	2H1835	D14
WINGS & INTS NORM CONT	15-215	1H1836	D10
WINGS & INTS ALT CONT	15-216	2H1836	E14
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6
INT 4 IND SUP	1-213	4E531	F9
RH CYCLIC TIMER CONT	15-216	2H1835	D14
WINGS & INTS NORM CONT	15-215	1H1836	D10
WINGS & INTS ALT CONT	15-216	2H1836	E14

(8) Open the appropriate spill door as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) Remove the locking pin from the selector valve associated with the hydraulic system being used and the spill door being operated.

(c) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(d) Make available electrical ground power as detailed in 24-41-00.

(e) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power

controlled by a responsible person associated with work on the intakes.

(f) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "OPEN" until the spill door is open 80 per cent (30 deg), approximately. Release the switch.

(g) Depressurize the hydraulic system.

(h) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(i) Trip the circuit breaker reset in operation (c) and fit a safety clip.

(j) Refit the locking pin, removed in operation (b), to the selector valve.

(k) Refit, and lock, the anti-interference plate to the intake management panel.

(9) Fit, and secure, the protective cover to the intake lip.

(10) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(11) Place the crawling board on the floor of the intake, aft of the servicing extension.

(12) Position a support beneath the spill door.

R (13) Remove the appropriate access panels (411 or 431 HB;
R 411 FL and GL, 421 FR and GR, 431 FL and GL or
R 441 FR and GR) from the spill door hinge positions,
R and remove the access panel (411 HZ, 421 HZ, 431 HZ
R or 441 HZ) from inside the intake, releasing the
R fasteners in the order stated on the illustration
R (Ref. Fig. 402).

R (14) Release and open the appropriate hinged panels (411,
R 421, 431 or 441 PZ, QZ and RZ) along the bottom
R forward end of the vane.

R (15) Remove the appropriate access panel (411 HL,
R 421 HR, 431 HL or 441 HR) from the intake

sidewall.

(16) Assemble the door handling equipment as follows:-

(a) Install the handling equipment in the intake, taking care to avoid causing damage.

(b) Ensuring that the turnbuckles are positioned on the sidewall side of the spill door, connect the sling to the door.

C. Remove Spill Door (Ref. Fig. 401)

(1) Disconnect the link from the spill door position indicator resolver as detailed in 71-64-16.

(2) Loosen the locknuts of the two vane position indicator microswitches (Ref. 71-64-15) and move them forward (away from the spill door) to prevent damage.

(3) Remove the nut and bolt securing the angle bracket of the bonding lead to the vane.

(4) Disconnect the electrical cables from the appropriate terminal blocks on the forward end of the vane and on the bottom outer longeron near the spill door.

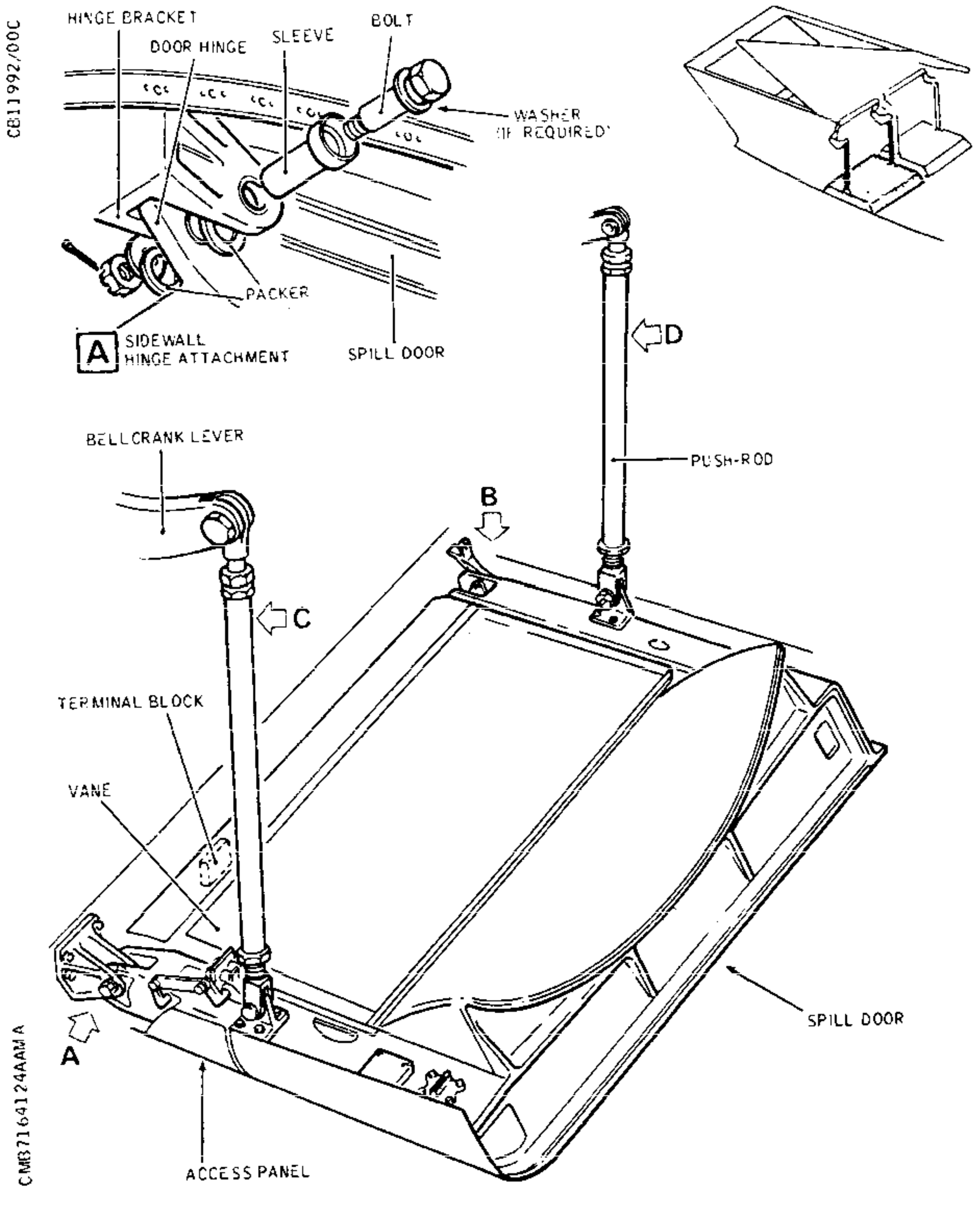
(5) Disconnect the push-rod at the centre wall position (Detail D), as follows:-

(a) Remove the split pin and nut from the 'D' bolt connecting the push-rod to the spill door bracket.

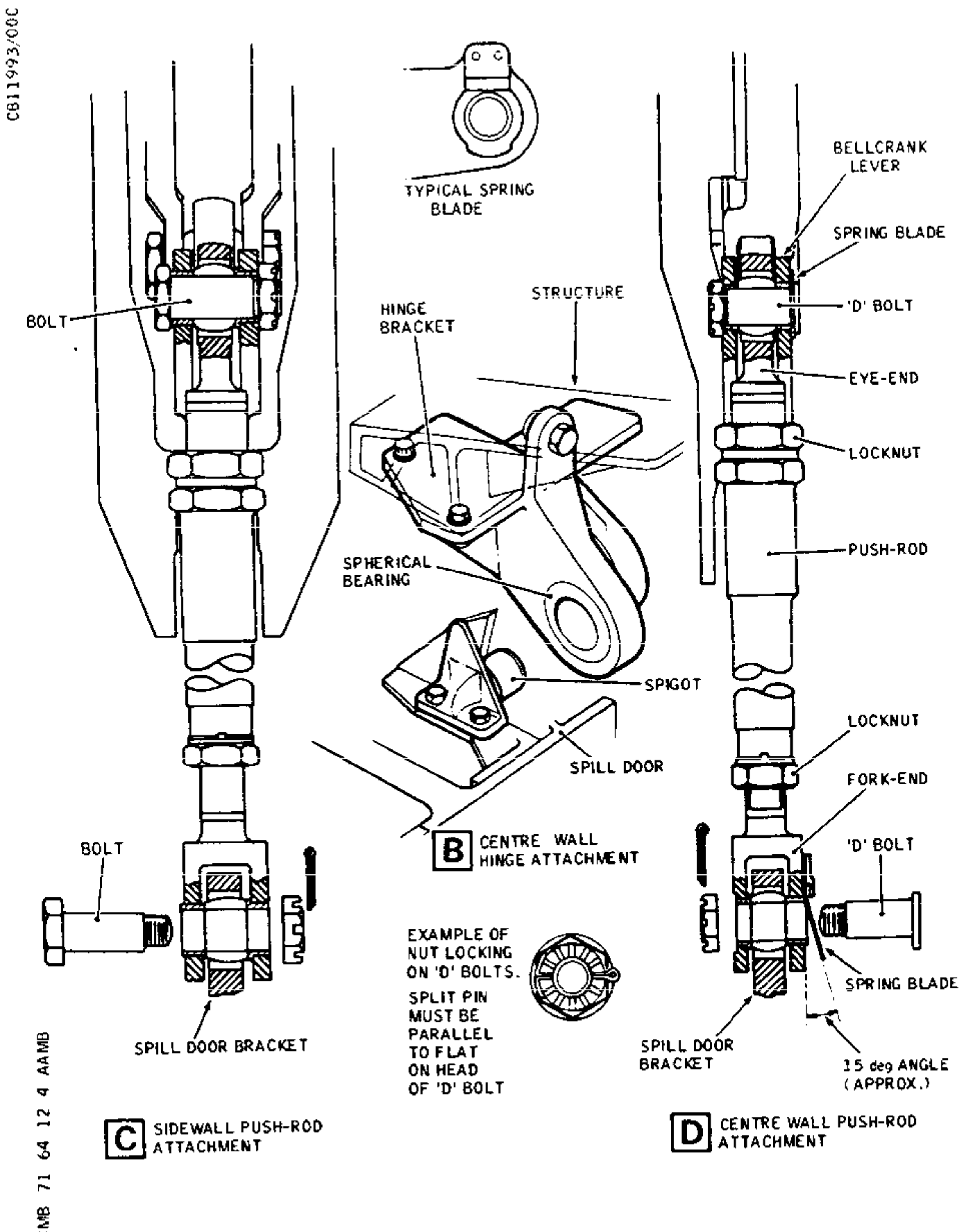
(b) Ensuring that the eye-end and fork-end are restrained so that a load is not transferred to the bellcrank lever and door bracket, loosen the locknuts on the push-rod.

(c) Press on the spring blade, to hold it flat against the fork-end, and withdraw the 'D' bolt. If the bolt cannot be easily removed, carry out operation (d).

(d) Using the alignment tools to maintain the eye-end and fork-end aligned, rotate the push-rod body (to increase rod length)



\- Spill Door - Installation (Sheet 1 of 2)
R Figure 401



R - Spill Door - Installation (Sheet 2 of 2)
Figure 401

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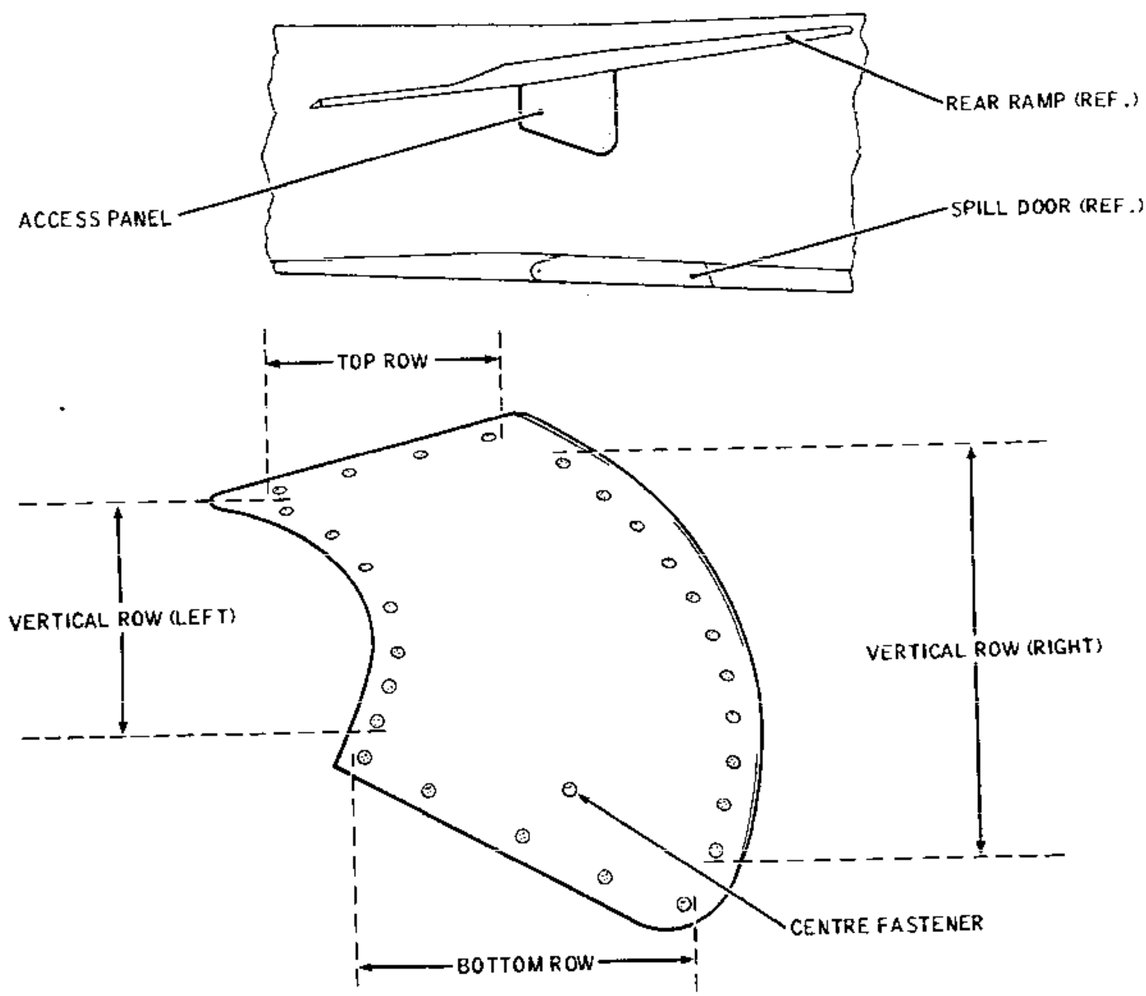


TO REMOVE ACCESS PANEL

NOTE: EACH FASTENER MUST BE FULLY UNSCREWED.

UNSCREW FASTENERS IN THE FOLLOWING ORDER:-

1. CENTRE FASTENER.
2. VERTICAL ROWS (LEFT AND RIGHT), STARTING IN CENTRE AND WORKING, ALTERNATELY, EACH SIDE OF CENTRE.
3. TOP ROW.
4. BOTTOM ROW.

TO FIT PANEL

INSERT FASTENERS IN REVERSE ORDER OF REMOVAL (i.e., PARAS., 4, 3, 2, AND 1.

CMB 71 64 12 4 AF MO

R - Intake Internal Panels - Installation
Figure 402

until the 'D' bolt can be easily moved, indicating that the push-rod is in a 'no-load' condition. Press on the spring blade and remove the bolt.

(e) Remove the alignment tools.

(6) Ensure that the spill door is firmly supported.

(7) At the sidewall position (Detail C), remove the split pin, nut and bolt connecting the push-rod to the spill door bracket.

(8) Secure both push-rods so that they will not be damaged or cause hindrance.

(9) Support the door (weight, 146 lb (64 kg) approximately) on the cables of the door handling equipment; remove the support from beneath the spill door.

(10) At the sidewall position (Detail A), remove the split pin, nut, washer, bolt and (if fitted) washer retaining the sleeve in the hinge bracket.

(11) Ensure that the spill door is supported, then remove the sleeve and packers. Identify the packers with the positions from which they were removed.

CAUTION: DURING OPERATION (12) EXTREME CARE MUST BE TAKEN TO AVOID DAMAGE. DO NOT LOWER THE SPILL DOOR MORE THAN IS NECESSARY FOR THE SIDEWALL HINGE TO CLEAR THE HINGE BRACKET AND LOCAL STRUCTURE, OTHERWISE DAMAGE MAY RESULT, PARTICULARLY TO THE SPHERICAL BEARING HOUSING OF THE CENTRE WALL HINGE BRACKET.

(12) Disengage the spill door spigot (Detail B) from the spherical bearing at the centre wall hinge position, as follows:-

(a) Carefully lower the sidewall side of the spill door by lengthening the turnbuckles, (1.5 to 2.0 in (38.1 to 50.8 mm) approximately), until the sidewall hinge is sufficiently clear of the hinge bracket and local structure to allow the spill door to be moved sideways.

(b) Ensuring that the resolver, microswitches and associated mechanisms located at the hinged end of the vane and spill door are clear, move the spill door sideways (i.e., intakes 2 and 3, toward the fuselage; intakes 1 and 4, toward the wing tip) until the spill door spigot is clear of the spherical bearing in the hinge bracket.

(13) Using the door handling equipment, in conjunction with the Mini-lift, lower the spill door clear of the aircraft. Shorten the turnbuckles until the door hinges are approximately horizontal and then place the door on a suitable stand.

(14) If required, carry out the following procedures:

(a) Remove the sling from the spill door.

(b) Remove the vane as detailed in paragraph 3.C.

(c) Remove the push-rods from the intake as detailed in 71-64-14.

D. Prepare to Install Spill Door

(1) If applicable, carry out the following procedures:

(a) Install the vane as detailed in paragraphs 3.D. and E.

(b) Secure the sling to the spill door, with the turnbuckles on the sidewall side of the door.

(c) Assemble the push-rods in the intake walls as detailed in 71-64-14.

(2) Using the alignment tools to retain the fork-end and eye-end aligned, rotate each push-rod body until the maximum thread engagement is achieved (i.e., each push-rod is at its minimum length). Remove the alignment tools.

E. Install Spill Door

<u>WARNING</u>: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

(1) Ensure that the safety precautions taken in operations B.(2) to (7) have not been cancelled.

(2) Set the spherical bearing, in the centre wall hinge bracket, ready to receive the spill door spigot.

(3) Using the door handling equipment, in conjunction with the Mini-lift, position the spill door as follows:-

(a) Raise the door; adjust the turnbuckles so that the trailing edge of the door is at an angle of 30 deg (approximately), relative to the hinge axes.

(b) Lengthen the turnbuckles 1.5 to 2.0 in (38.1 to 50.8 mm) so that the door tilts 4 to 5 deg (approximately).

(c) Raise the door further until the spigot is approximately aligned with the spherical bearing.

CAUTION: DURING OPERATION (4), EXTREME CARE MUST BE TAKEN TO AVOID DAMAGE.

(4) Engage the spill door spigot with the spherical bearing at the centre wall position, as follows:-

(a) Manoeuvre the spill door until the spigot is exactly aligned with the hole in the spherical bearing.

NOTE: It may be necessary to move the spherical bearing to align with the spigot.

(b) Ensuring that the resolvers, microswitches and mechanisms and the vane bonding lead at the forward end of the vane are clear, carefully move the spill door sideways until the spigot enters the spherical bearing correctly; fully engage the spigot in the bearing.

(5) Raise the sidewall side of the spill door (by shortening the turnbuckles), and engage the door hinge in the bracket; align the holes and insert the sleeve. Do not insert the packers at this stage.

(6) Fit the bolt, washer and nut to secure the sleeve; hand-tighten the nut.

(7) Measure the gap between the centre wall edges of the adjoining spill doors, with both doors fully closed, as follows:-

(a) Using the door handling equipment, in conjunction with the Mini-Lift, fully close the door; retain the door in this position on a support.

(b) Ensure that the adjoining door is fully closed.

(c) Check that the gap between the doors is 0.080 to 0.200 in (2.032 to 5.080 mm).

CAUTION: A PACKER MUST BE FITTED BETWEEN EACH SIDE OF THE SPHERICAL BEARING AND THE HINGE BRACKET.

(8) Measure and record the gap between each side of the spherical bearing and the hinge bracket at the side-wall position.

(9) If the requirement of operation (7)(c) is met, ignore operation (10) and continue with operation (11).

(10) If the requirement of operation (7)(c) is not met, calculate the thickness of packers required.

(11) Obtain packers of the thickness (+0 -0.001 in (+0 -0.0254 mm)) determined in either operation (9) or (10).

NOTE: It may not be possible to obtain packers of the exact thickness required. If this situation is encountered, the thickness of packers required to produce a gap within the previously stated limits must be calculated.

(12) Remove the support and lower the spill door to the 50 per cent (18 deg) (approximately) open position; retain the door in this position on a support.

(13) Remove the nut, washer and bolt securing the sleeve.

(14) Ensure that the door is supported; remove the sleeve.

(15) Insert the packers between the spherical bearing and hinge bracket, align the holes and reinsert the sleeve.

(16) Fit the bolt (with, if previously fitted, a washer

under its head), washer and nut to secure the sleeve. Torque-tighten the nut to between 60 and 70 lbf in (0.678 and 0.791 mdaN), aligning the split pin hole. Do not fit a split pin at this stage.

(17) Fully close the door; check that the requirement of operation (7)(c) is now met.

(18) Check that a gap, (dimension 'Z') (Ref. Fig. 403), of 0.11 in (2.794 mm) (minimum) exists between the side of the splined lever and the end of the bolt, with one and one-half (minimum) bolt threads protruding through the nut.

(19) If the requirements of operation (18) are met, fit a split pin to the nut. Ignore operation (20) and continue with operation (21).

(20) If the requirements of operation (18) are not met, proceed as follows:-

(a) Ascertain by how much the gap is below the required minimum, taking into account that when finally assembled one and one-half (minimum) bolt threads must protrude through the nut.

(b) Remove the nut, washer and bolt from the sleeve.

(c) Place under the bolt head, a washer of the thickness determined in operation (a).

(d) Insert the bolt into the sleeve and fit the washer and nut.

(e) Torque-tighten the nut to between 60 and 70 lbf in (0.678 and 0.791 mdaN), aligning the split-pin holes.

(f) Check that the gap and thread protrusion are as quoted in operation (18), and then fit a split pin.

(21) Raise the spill door to the closed position; retain the door in this position on a support.

(22) Connect the electrical cables to the terminal block on the vane hinge structure, ensuring that the connections are made in accordance with the cable identifications and the applicable

wiring diagram.

(23) Torque-tighten the terminal nuts to between 12 and 14 lbf in (0.136 and 0.158 mdaN) in accordance with 20-27-14.

(24) Remove the support and lower the spill door to the 38 deg (approximately) position; retain the door in this position on a support.

(25) Using the door handling equipment, in conjunction with the Mini-lift, raise and lower the spill door, checking that the door moves freely.

(26) Set the spill door to the 50 per cent (18 deg) (approximately) open position; retain the door in this position on a support.

(27) Remove the sling from the spill door and remove the door handling equipment from the intake.

CAUTION: IN OPERATIONS (28) AND (30), UNDER NO CIRCUMSTANCES IS IT PERMISSIBLE TO EXCEED THE MAXIMUM TORQUE VALUE, OR TO UNSCREW THE NUT (RESULTING IN AN UNKNOWN TORQUE VALUE) IN AN ATTEMPT TO INSERT A SPLIT PIN.

(28) At the centre wall position, proceed as follows:-

(a) Check that the profile of the spring blade is at an angle of 15 deg (approximately) to the side of the push-rod fork-end.

CAUTION: IN OPERATION (b), ENSURE THAT THE GREASE DOES NOT CONTACT THE PTFE LINING OF THE SPHERICAL BEARING.

(b) Lightly coat the 'D' bolt with Never-Seez grease; press and hold the spring blade flat against the fork-end and insert the 'D' bolt, ensuring that the head is correctly placed.

(c) Press lightly on the tail of the 'D' bolt, until the bolt just moves; check that the spring blade restricts the bolt movement to not more than 0.10 in (2.54 mm). If movement exceeds 0.10 (2.54 mm), the spring blade is unserviceable, therefore, a serviceable bell-crank lever (including spring blade) must be fitted (Ref. 71-64-14).

(d) Fit the nut to the 'D' bolt.

CAUTION: IN OPERATION (e), THE SPLIT PIN HOLES MUST BE ALIGNED HORIZONTALLY.

(e) Torque-tighten the nut to 300 lbf in (3.390 mdaN) (minimum value). If the split pin cannot be inserted (i.e., holes not aligned) progressively increase torque to 650 lbf in (7.345 mdaN) (maximum value), checking throughout if the split pin can be inserted horizontally.

CAUTION: IN OPERATION (29) THE LEGS OF THE SPLIT PIN MUST NOT BE BENT OVER THE END OF THE BOLT.

(29) Fit a split pin (horizontally) to the nut on the 'D' bolt. Turn the split pin legs in opposite directions around the nut; crop the legs and push each leg into a castellation to prevent the split pin from turning.

(30) Position the sidewall push-rod fork-end on the door bracket; insert the bolt and fit the nut. Torque-tighten the nut to 600 lbf in (6.780 mdaN) (minimum value). If the split pin cannot be inserted (i.e., holes not aligned) progressively increase torque to 1,200 lbf in (13.560 mdaN) (maximum value), checking throughout if the split pin can be inserted. Fit a split pin.

(31) Connect the link to the spill door position indicator resolver as detailed in 71-64-16.

(32) Connect the electrical cables to the terminal block on the bottom outer longeron, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(33) Torque-tighten the terminal nuts to between 12 and 14 lbf in (0.136 and 0.158 mdaN) in accordance with 20-27-14.

(34) Position the angle bracket of the bonding lead on the vane; fit the bolt and nut.

(35) Torque-tighten the nut to between 30 and 40 lbf in (0.339 to 0.452 mdaN).

(36) Check that the electrical bonding between the vane

and structure is in accordance with 20-27-11.

(37) Encapsulate the nut with sealant in accordance with 20-22-19.

F. Conclusion

(1) Rig the spill doors and pre-load the push-rods as detailed in Adjustment/Test.

(2) Reposition the vane position indicator microswitches and adjust them as detailed in 71-64-15.

(3) Check, and adjust if necessary, the spill door position indicator resolver setting as detailed in 71-64-16, Adjustment/Test.

(4) Remove the safety clips and reset the following circuit breakers associated with the intake (Ref. para.B.(7)):-

(a) LH or RH CYCLIC TIMER CONT.

(b) WINGS & INTS NORM CONT.

(c) WINGS & INTS ALT CONT.

(5) Carry out an Operational Test of the associated wing and intake cyclic de-icing system in accordance with 30-11-00, Adjustment/Test. with the Mini-lift, raise and lower the spill this position on a support.

3. Vane

WARNING: IF A VANE IS BEING REMOVED AND INSTALLED WHILST THE ASSOCIATED SPILL DOOR IS INSTALLED ON THE AIRCRAFT, OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

A. Equipment and Materials

DESCRIPTION	PART NO.
Extractor, for vane hinge pin	E925044000
Support, for spill door when fully closed	-

DESCRIPTION	PART NO.
Support, for vane	E925051000
Torque spanner, 12 to 14 lbf in (0.136 to 0.158 mdaN)	Ultra-WB808-6UNC
Torque spanner, 30 to 40 lbf in (0.339 to 0.452 mdaN)	-
Torque spanner, 80 to 90 lbf in (0.904 to 1.017 mdaN)	-
Torque spanner, 120 to 140 lbf in (1.356 to 1.582 mdaN)	-
Locking wire	-
Jointing compound, Mastinox	-
Viton sealant	-

B. Prepare to Remove Vane

(1) Carry out the procedures detailed in paragraphs 2.B.(2) to (11).

NOTE: This instruction may be ignored if the spill door has been removed from the aircraft.

(2) Disconnect both dampers from the idler levers as detailed in paragraph 4.C.

(3) If applicable (spill door installed), close the appropriate spill door as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) Remove the locking pin from the hydraulic selector valve associated with the spill door being operated and the hydraulic system being used.

(c) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.2.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(d) Make available electrical ground power as detailed in 24-41-00.

(e) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(f) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "SHUT" until the spill door is fully closed. Release the switch.

(g) Depressurize the hydraulic system.

(h) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(i) Trip the circuit breaker reset in operation (c) and fit a safety clip.

(j) Refit the locking pin, removed in operation (b), to the selector valve.

(k) Refit, and lock, the anti-interference plate to the intake management panel.

(4) Position a support beneath the spill door.

R (5) Release and open the appropriate hinged panels (411,
R 421, 431 or 441 PZ, QZ and RZ) along the bottom
R forward end of the vane.

C. Remove Vane (Ref. Fig. 403)

(1) Fully open the vane; support the vane in this position.

NOTE: This instruction is optional if the spill door is removed from the aircraft.

(2) Support the hinged end of the vane throughout its length.

(3) Remove the nut and bolt securing the angle bracket of the bonding lead to the vane.

(4) To enable the vane hinge pin extractor to be used, disconnect the electrical cables and then remove the terminal block attached to the vane structure at the hinge end.

WARNING: THE VANE MUST BE FIRMLY SUPPORTED TO PREVENT ITS SLIPPING WHEN THE HINGE PINS ARE REMOVED IN OPERATIONS (4) and (5).

(5) Remove the vane hinge pin from the centre wall position, as follows:-

(a) Remove the hinge bolt.

(b) Remove the sealant, nuts, locking tabs and bolts, securing the hinge washer and support plate.

(c) Remove the hinge washer, packer/shims (2) (if any) and support plate. If packer/shims are fitted, identify them with the position from which they were removed.

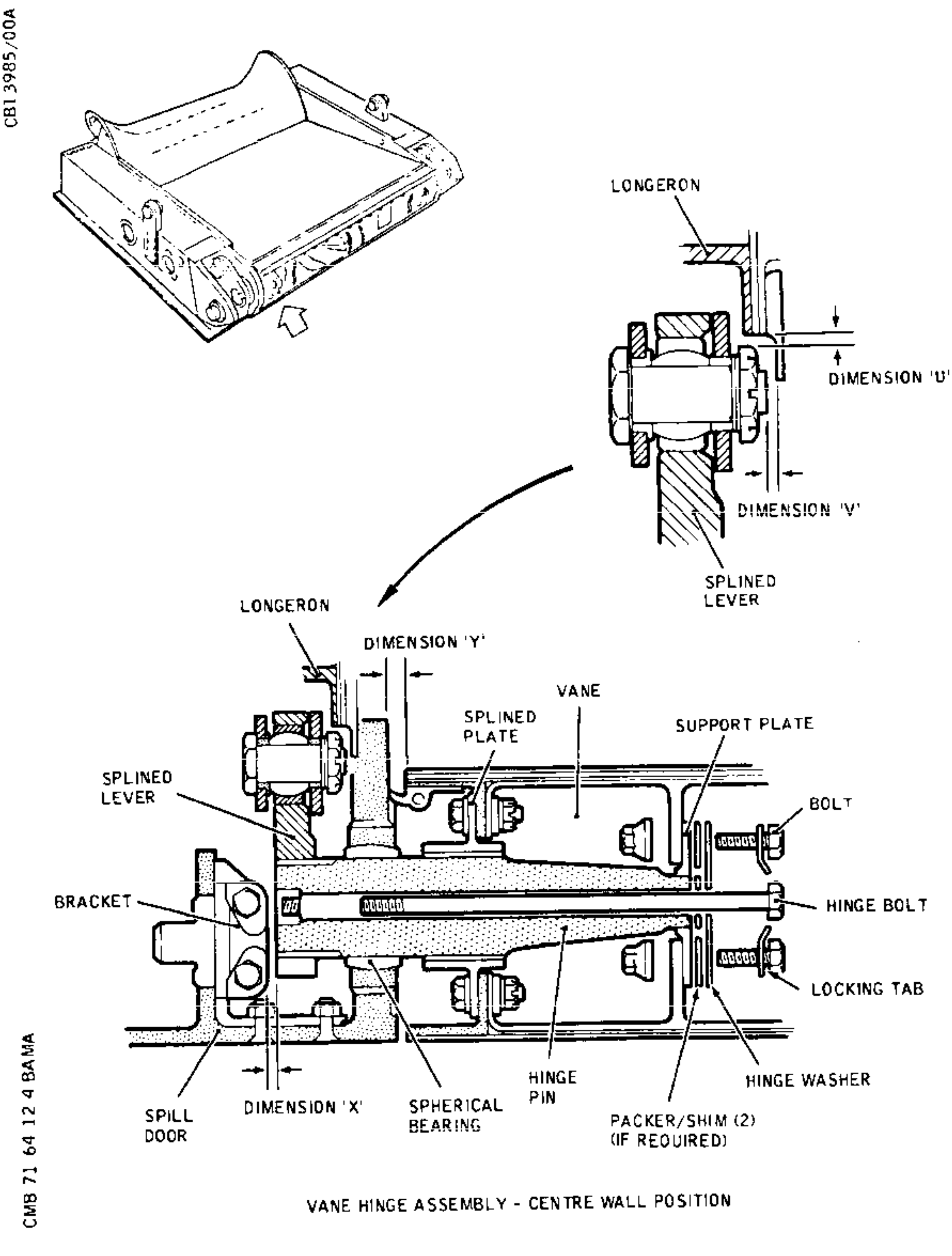
(d) Fit the extractor to the hinge pin assembly.

(e) Using the extractor, carefully withdraw the hinge pin from the splined lever and spherical bearing, ensuring that the splines slide freely and without damaging the spherical bearing.

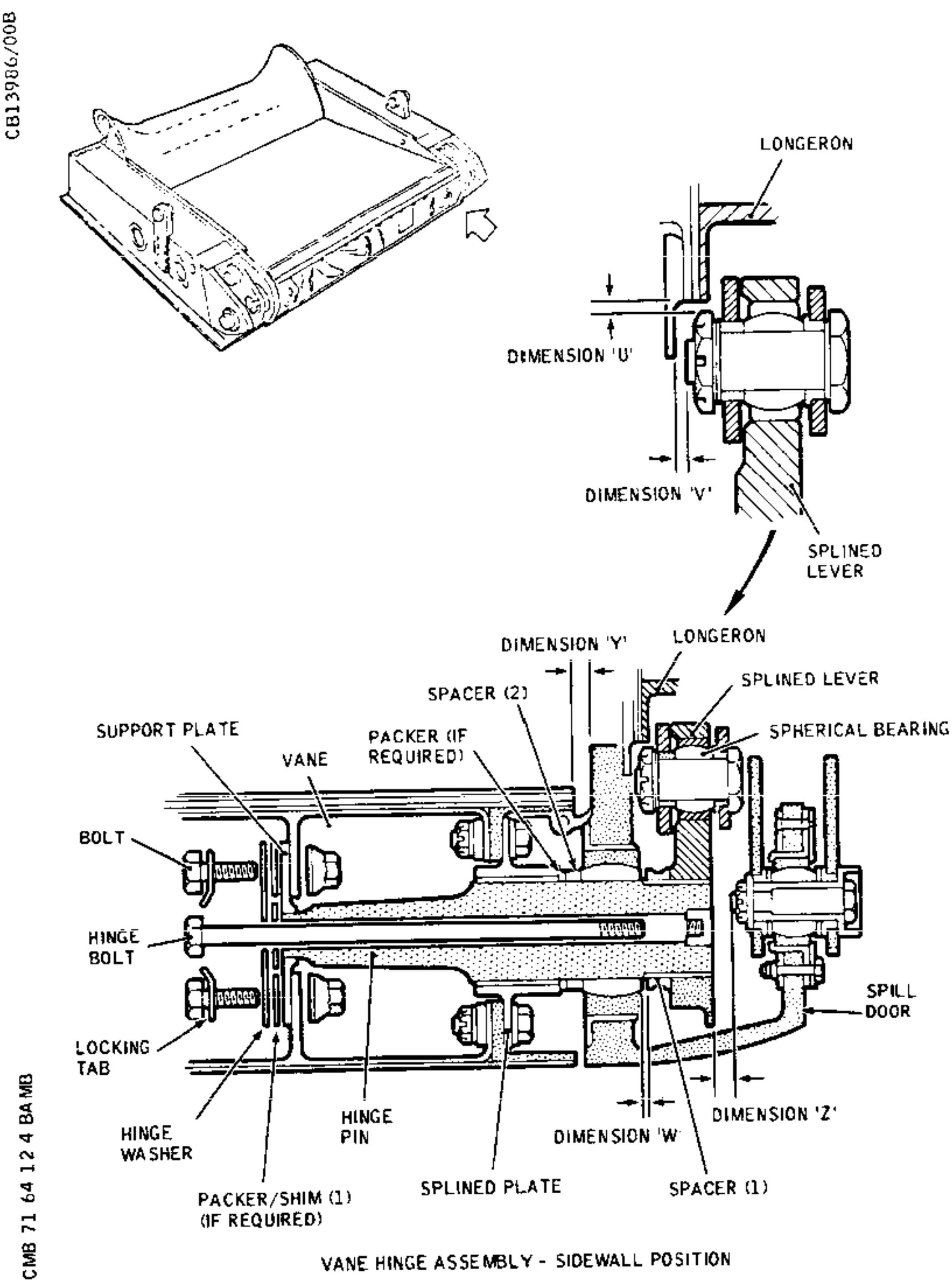
(f) Remove the extractor from the hinge assembly.

(6) Remove the vane hinge pin from the sidewall position, as follows:-

(a) Remove the hinge bolt.



\- Vane Installation (Sheet 1 of 2)
Figure 403



Vane Installation (Sheet 2 of 2)
Figure 403

(b) Remove the sealant, nuts, locking tabs and bolts securing the hinge washer and support plate.

(c) Remove the hinge washer, packer/shims (1) (if any) and support plate. If packer/shims are fitted, identify them with the position from which they were removed.

(d) Fit the extractor to the hinge pin assembly.

(e) Using the extractor, carefully withdraw the hinge pin from the splined lever, spacer (1), spherical bearing, spacer (2) and packer (if any), ensuring that the splines slide freely and without damaging the spacers, packers and spherical bearing.

(f) Remove the extractor from the hinge assembly.

(7) Remove the vane support.

(8) Remove the vane from the spill door. Retain the spacer (1).

(9) Remove from the sidewall hinge pin, the spacer (2) and packer (if any). If a packer is fitted, identify it with the position from which it is removed.

D. Prepare to Install Vane

(1) Locate and suitably mark (e.g., with pencil) the master spline on the following items:-

(a) Both splined levers.

(b) Both hinge pins, at centre and end splines.

(c) Both splined plates.

(d) Apply Mastinox jointing compound to the end splines on both hinge pins.

E. Install Vane

WARNING: IF THE SPILL DOOR IS INSTALLED ON THE AIRCRAFT, OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

(1) If applicable (spill door installed), ensure that

the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.

(2) Place the packer, as identified on removal, and spacer (2) on the protruding end of the hinge pin at the sidewall position.

(3) Position the vane on the spill door.

(4) Align the hole in the spherical bearing with the hole in the splined plate at each side of the vane. Firmly support the vane in this position.

(5) Connect the vane to the spill door at the centre wall position, as follows:-

(a) Align the master spline of the hinge pin centre splines with the master spline in the splined plate.

(b) Carefully engage the splines and push the hinge pin through the spherical bearing, ensuring that the splines slide freely and without damaging the spherical bearing.

(c) Align the master spline of the hinge pin end splines with the master spline in the splined lever.

(d) Engage the splines and push the hinge pin to full engagement in the splined lever.

(6) Connect the vane to the spill door at the sidewall position as follows:-

(a) Align the master spline of the hinge pin centre splines with the master spline in the splined plate.

(b) Carefully engage the splines and push the hinge pin through the spacer (2) and spherical bearing, ensuring that the splines slide freely and without damaging the packer (if any), spacer (2) and spherical bearing.

(c) Position the spacer (1) between the spherical bearing and the splined lever.

(d) Align the master spline of the hinge pin end splines with the master spline in the splined lever.

(e) Engage the splines and push the hinge pin to full engagement in the splined lever.

(7) At the sidewall and centre wall hinge positions, proceed as follows:-

(a) Fit the support plate, hinge washer, packer/shims (1) (if any, in the positions identified on removal), bolts, locking tabs and nuts. Do not tighten the nuts at this stage.

(b) Fit the hinge bolt and torque-tighten it to between 80 and 90 lbf in (0.904 and 1.017 mdaN). Do not wire-lock the bolt at this stage.

(c) Torque-tighten the nuts on the bolts securing the hinge washer and support plates to between 120 and 140 lbf in (1.356 and 1.582 mdaN). Do not apply sealant at this stage.

(8) Move the vane sideways toward the spill door sidewall position so that the splined plate, packer (if any) and spacer (2) are in contact with the spherical bearing, i.e., no space between any of these items.

(9) Check that the vane is central within the spill door frame, i.e., that dimensions 'Y' (Ref. Fig. 403) are equal.

(10) If the vane is central, ignore operation (11) and continue with operation (12).

(11) If the vane is not central, adjust the thickness of the packer between the splined plate and spacer (2), as follows:-

(a) Measure and record both gaps, (dimensions 'Y') (Ref. Fig. 403).

(b) Ascertain in which direction, and by how much, the vane requires to be moved to centralize it.

(c) At the sidewall hinge position, remove the nuts, bolts, locking tabs, hinge bolt, hinge washer, support plate and, if any, packer/shims (1).

(d) Withdraw the hinge pin at the sidewall position.

NOTE: It may be necessary to use the extractor to withdraw the hinge pin.

(e) Remove the spacer (2) and packer (if any).

(f) If required, obtain packers (maximum of two) to make the thickness determined in operation (b).

(g) Place the packers (if required) and spacer (2) on the hinge pin.

(h) Ensure that the spacer (1) is in position and that the master splines of the hinge pin and splined lever are aligned.

(i) Engage the splines and push the hinge pin to full engagement in the splined lever.

(j) Repeat operations (8) and (9).

(k) Fit the support plate, hinge washer, packer/shims (1) (if any, in the positions identified on removal), bolts, locking tabs and nuts. Do not tighten the nuts at this stage.

(l) Fit the hinge bolt and torque-tighten it to between 80 and 90 lbf in (0.904 and 1.017 mdaN). Do not wire-lock the bolt at this stage.

(m) Torque-tighten the nuts on the bolts securing the hinge washer and support plate to between 120 and 140 lbf in (1.356 and 1.582 mdaN). Do not apply sealant at this stage.

(12) At the sidewall hinge position, continue as follows:-

(a) Centralize the vane within the spill door frame (Ref. para.(9)).

(b) Hold the spacer (1) against the splined lever.

(c) Check that a gap, dimension 'W' (Ref. Fig. 403), of between 0.010 and 0.020 in (0.254 and 0.508 mm) exists between the spacer (1) and the spherical bearing.

(d) If the gap is not satisfactory, ignore operation (e) and proceed with operations (13) and (14).

(e) If the gap is satisfactory, lock the hinge bolt to both locking tabs with locking wire in accordance with 20-21-13. Apply sealant in accordance with 20-22-19 to the nuts and heads of the bolts securing the hinge washer and support plate. Ignore operations (13) and (14).

(13) Ascertain the thickness of packer/shims (1) (if any) which will be required between the support plate and hinge washer to meet the requirements of operation (12)(c).

NOTE: The addition of packer/shims (1) will reduce the gap; the removal of packer/shims (1) will increase the gap, dimension 'W' (Ref. Fig. 403).

(14) If required, obtain packer/shims (1) of the thickness determined in operation (13), using one packer, and two shims not more than 0.016 in (0.406 mm) thick. Then proceed as follows:-

(a) Remove the nuts, bolts and locking tabs securing the hinge washer, support plate and packer/shims (1) (if any).

(b) Adjust the thickness of the packer/shims (1), as previously determined.

(c) Refit the bolts, locking tabs, and nuts. Do not tighten the nuts at this stage.

(d) Refit the hinge bolt and torque-tighten it to between 80 and 90 lbf in (0.904 and 1.017 mdaN).

(e) Torque-tighten the nuts on the bolts securing the hinge washer and support plate to between 120 and 140 lbf in (1.356 and 1.582 mdaN). Apply sealant in accordance with 20-22-19 to the nuts and bolt heads.

(f) Lock the hinge bolt to both locking tabs with locking wire in accordance with 20-21-13.

(15) Centralize the vane within the spill door frame (Ref. para.(9)).

(16) At the centre wall hinge pin position, proceed as follows:-

(a) Check that a gap, dimension 'X' (Ref. Fig. 403), of between 0.110 and 0.160 in (2.794 and 4.064 mm) exists between the bracket and the splined lever.

(b) If the gap is not satisfactory, ignore operation (c) and proceed with operations (17) and (18).

(c) If the gap is satisfactory, lock the hinge bolt to both locking tabs with locking wire in accordance with 20-21-13. Apply sealant in accordance with 20-22-19 to the nuts and heads of the bolts securing the hinge washer and support plate. Ignore operations (17) and (18).

(17) Ascertain the thickness of the packer/shims (2) (if any) which will be required between the support plate and hinge washer to meet the requirements of operation (16)(a).

NOTE: The addition of packer/shims (2) will increase the gap; the removal of packer/shims (2) will reduce the gap, dimension 'X' (Ref. Fig. 403).

(18) If required, obtain packer/shims (2) of the thickness determined in operation (17), using one packer, and two shims not more than 0.016 in (0.406 mm) thick. Then proceed as follows:-

(a) Remove the nuts, bolts and locking tabs securing the hinge washer, support plate and packer/shims (2) (if any).

(b) Adjust the thickness of the packer/shims (2), as previously determined.

(c) Refit the bolts, locking tabs, and nuts. Do not tighten the nuts at this stage.

(d) Refit the hinge bolt and torque-tighten it to between 80 and 90 lbf in (0.904 and 1.017 mdaN).

(e) Torque-tighten the nuts on the bolts securing the hinge washer and support plate to between 120 and 140 lbf in (1.356 and 1.582 mdaN). Apply sealant in accordance with 20-22-19 to the nuts and bolt heads.

(f) Lock the hinge bolt to both locking tabs with locking wire in accordance with 20-21-13.

(19) If the vane has been installed to the spill door whilst the door was in position on the aircraft, check, and adjust if necessary, the clearance between the splined lever and the hinge bolt at the sidewall position (Ref. paras.2.E.(7) and (9)).

(20) Check that gaps, (dimensions 'U' and 'V') (Ref. Fig. 403), of 0.10 in (2.54 mm) minimum exist between the splined lever assembly and the cut-out in the longeron, and the spill door structure, at the sidewall and centre wall positions.

(21) Fit the terminal block to the vane, at the hinged end.

(22) Connect the electrical cables to the terminal block, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagrams.

(23) Torque-tighten the terminal nuts to between 12 and 14 lbf in (0.136 and 0.158 mdaN) in accordance with 20-27-14.

(24) Position the angle bracket of the bonding lead on the vane; fit the bolt and nut.

(25) Torque-tighten the nut to between 30 and 40 lbf in (0.339 and 0.452 mdaN).

(26) Check that the electrical bonding between the vane and structure is in accordance with 20-27-11.

(27) Encapsulate the nut with sealant in accordance with 20-22-19.

F. Conclusion

(1) Check, and adjust if necesary, the vane downstops (Ref. Adjustment/Test).

(2) Check the vane-to-spill-door clearances (Ref. Adjustment/Test).

(3) Connect the dampers to the idler levers as detailed in paragraphs 4.E.(8) and (9).

(4) If the vane has been installed in the spill door whilst the door was in position on the aircraft, carry out operations (a) to (j).

NOTE: If the spill door is off the aircraft, these operations will be carried out after door installation and adjustment.

(a) Check, and adjust if necessary, the setting of the vane position indicator microswitches as detailed in 71-64-15, Adjustment/Test.

(b) Remove the safety clips and reset the following circuit breakers associated with the intake (Ref. para.2.B.(7)):-

b1) LH or RH CYCLIC TIMER CONT.

b2) WINGS & INTS NORM CONT.

b3) WINGS & INTS ALT CONT.

(c) Carry out an Operational Test of the associated wing and intake cyclic de-icing system in accordance with 30-11-00, Adjustment/Test.

(d) Refit the access panels previously removed.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT, THROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(e) Remove all tools and equipment from the intake, and ensure that the intake is clean.

(f) Remove the locking pins from the hydraulic selector valves of the four intakes.

(g) Remove the safety clips and reset the remaining circuit breakers previously tripped (Ref. paras. 2.B.(6) and (7)).

(h) On the intake management panel, proceed as follows:-

h1) Remove the anti-interference plate.

h2) Leave the four RAMP/SPILL MASTER switches at the MAN position.

h3) Set the four HYD switches to "AUTO".

(i) Remove the warning placard from the engine start panel.

(j) Remove the barriers from beneath the spill doors and from the intake entries.

4. Damper

WARNING: IF A DAMPER IS BEING REMOVED AND INSTALLED WHILST THE ASSOCIATED SPILL DOOR IS IN POSITION ON THE AIRCRAFT, OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

A. Equipment and Materials

	DESCRIPTION	PART NO.
	Extractor, for vane hinge pin	E925044000
	Damper transfer gauge	D925385000
	Torque spanner, 40 to 45 lbf in (0.452 to 0.508 mdaN)	-
	Torque spanner, 70 to 80 lbf in (0.791 to 0.904 mdaN)	-
	Torque spanner, 80 to 90 lbf in (0.904 to 1.017 mdaN).	-
	Torque spanner, 80 to 100 lbf in (0.904 to 1.130 mdaN)	-
R R	Torque spanner, 110 to 120 lbf in (1.243 to 1.356 mdaN)	-
	Torque spanner, 120 to 140 lbf in (1.356 to 1.582 mdaN)	-
	Torque spanner, 165 to 185 lbf in (1.864 to 2.090 mdaN)	-

DESCRIPTION	PART NO.
Torque spanner, 240 lbf in (2.712 mdaN)	-
Aeroshell grease No.16	-
Locking wire	-

B. Prepare to Remove Damper

(1) Carry out the procedures detailed in paragraphs 2.B.(2) to (8).

NOTE: This instruction may be ignored if the spill door has been removed from the aircraft.

C. Remove Damper (Ref. Fig. 404)

R NOTE: Paragraphs (1) and (2) are alternatives, depending
R upon the modification state of the spill door
R centre wall box.

R (1) Before Mod.0420. Remove the damper from the spill door centre wall box (Ref. Fig. 404) as follows:-

NOTE: Gaining access to the bolt (1) of No.4 intake requires procedures different from those for the other three intakes. Therefore, for No.1, 2 or 3 intake, operations (a), (b) and (e) to (i) are applicable. For No.4 intake, operations (c) to (i) are applicable.

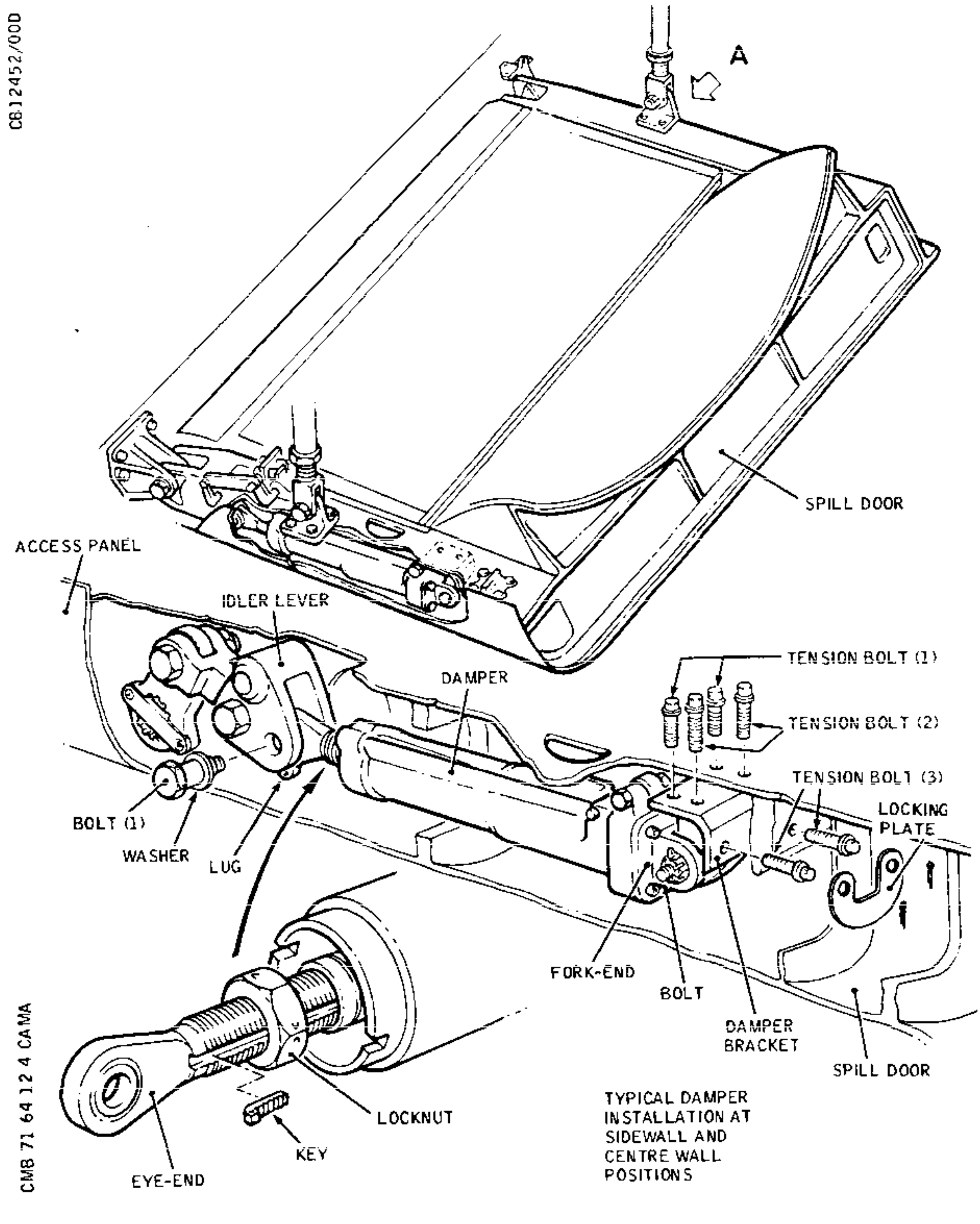
(a) Remove the split pin, nut, washer and bolt (2).

(b) Move the idler lever sufficiently to gain access to the head of the bolt (1) through the access hole.

(c) Release, and withdraw, the vane hinge pin from the splined lever, (Ref. para.3.C.(5)), to allow movement of the idler lever.

(d) Move the idler lever until the head of bolt (1) is accessible through the access hole.

(e) Working through the access hole, remove the



Damper - Installation (Sheet 1 of 2)
Figure 404

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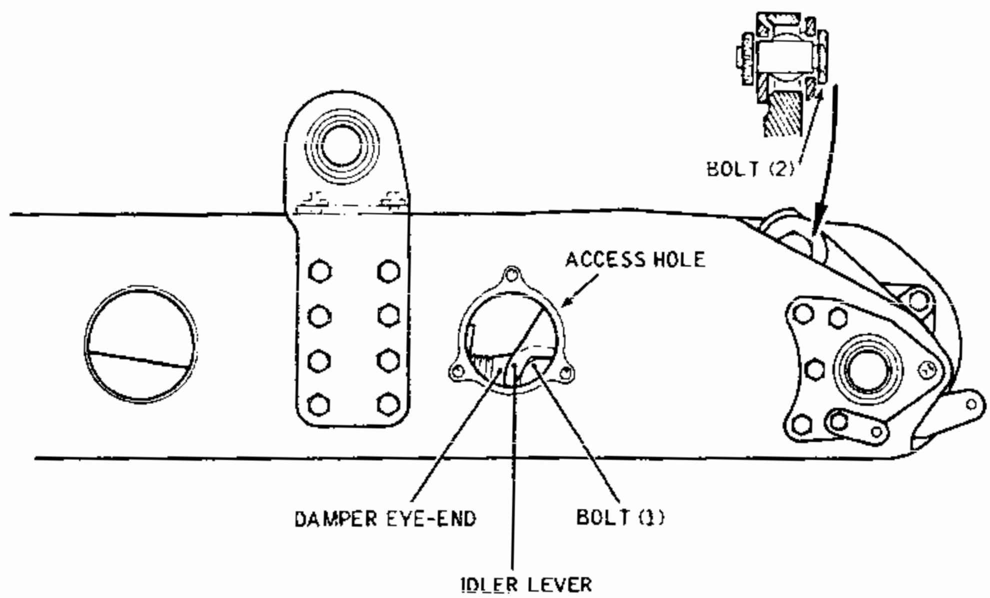
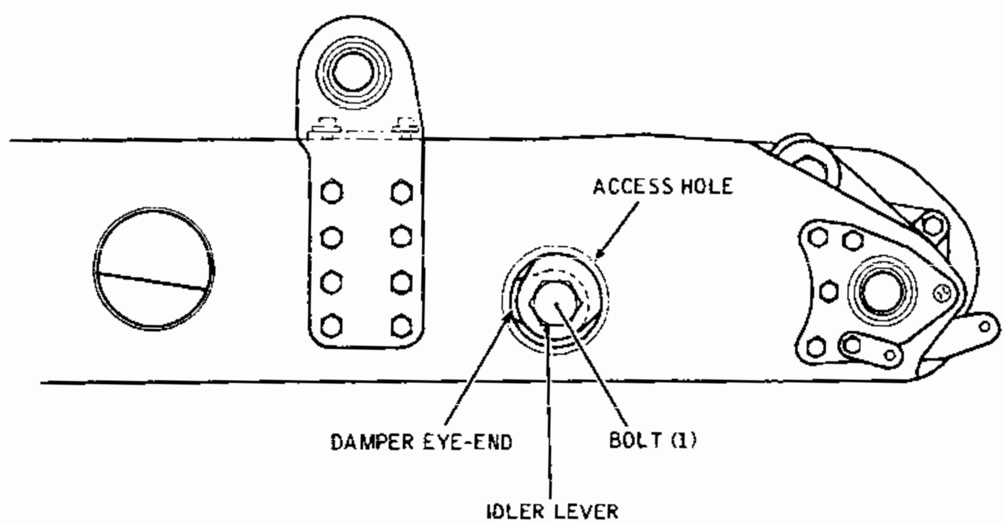


A CENTRE WALL BOX
BEFORE MOD.0420



A CENTRE WALL BOX
AFTER MOD.0420

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R Damper - Installation (Sheet 2 of 2)
Figure 404

locking wire, bolt (1) and washer securing the damper eye-end to the idler lever.

(f) Remove the four tension bolts (1) and (2) and washers securing the damper bracket to the top face of the spill door box.

(g) Working through the hole in the end of the box, remove the split pins, locking plate, two tension bolts (3) and washers securing the damper bracket inside the box.

(h) Carefully withdraw the damper, complete with the damper bracket, through the holes in the spill door structure.

(i) If required, remove the split pin, nut and bolt securing the damper fork-end to the damper bracket. Reassemble the bolt and nut to the damper.

R (2) After Mod.0420. Remove the damper from the spill door centre wall box (Ref. Fig. 404) as follows:-

NOTE: Gaining access to the bolt (1) of No.4 intake requires procedures different from those for the other three intakes. Therefore, for No.1 2 or 3 intake, operations (c) to (g) are applicable. For No.4 intake operations (a) to (g) are applicable.

(a) Release, and withdraw, the vane hinge pin from the splined lever, (Ref. para.3.C.(5)), to allow movement of the idler lever.

(b) Move the idler lever until the head of bolt (1) is accessible through the access hole.

(c) Working through the access hole, remove the locking wire, bolt (1) and washer securing the damper eye-end to the idler lever.

(d) Remove the four tension bolts (1) and (2) and washers securing the damper bracket to the top face of the spill door box.

(e) Working through the hole in the end of the box, remove the split pins, locking plate, two tension bolts (3) and washers securing the damper bracket inside the box.

(f) Carefully withdraw the damper, complete with the damper bracket, through the holes in the spill door structure.

(g) If required, remove the split pin, nut and bolt securing the damper fork-end to the damper bracket. Reassemble the bolt and nut to the damper.

R (3) Remove the damper from the spill door sidewall box (Ref. Fig. 404) as follows:

(a) Remove the access panel from the sidewall box, near the hinge.

(b) Remove the locking wire, bolt and washer securing the damper eye-end to the idler lever.

(c) Remove the four tension bolts (1) and (2) and washers securing the damper bracket to the top face of the spill door box.

(d) Working through the hole in the end of the box, remove the split pins, locking plate, two tension bolts (3) and washers securing the damper bracket inside the box.

(e) Carefully withdraw the damper, complete with the damper bracket, through the holes in the spill door structure.

(f) If required, remove the split pin, nut and bolt securing the damper fork-end to the damper bracket. Reassemble the bolt and nut to the damper.

D. Prepare to Install Damper

(1) Check, and adjust if necessary, the vane downstops setting as detailed in Adjustment/Test.

NOTE: This instruction may be ignored if the settings are known to be correct.

(2) Check the damper fully extended setting, as follows:-

NOTE: These instructions may be ignored if the damper setting is known to be correct.

(a) Adjust the transfer gauge until the pin centres dimension is as stated on the plate

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attached to the spill door box.

(b) Fully extend the damper.

(c) With the damper fork-end and eye-end in absolute alignment, place the ends over the pins on the transfer gauge, ensuring that the ends slide freely on the pins to full engagement. If the result of this operation is satisfactory, ignore operations (d) and (f) to (h).

(d) If the damper ends do not slide over the pins, note the direction in which the eye-end requires to be moved.

(e) Remove the damper from the transfer gauge.

(f) Loosen the locknut and rotate the eye-end, one half-turn at a time, in the direction previously noted. Tighten the locknut.

(g) Repeat operation (c).

(h) If necessary, repeat operations (d), (e), (f) and (g) until the damper setting is correct.

(i) Torque-tighten the locknut to 240 lbf in (2.712 mdaN) and then lock it to the key with locking wire in accordance with 20-21-13.

(j) Fully retract the damper.

(3) If applicable, connect the damper bracket to the damper, as follows:-

(a) Place the damper bracket in the fork-end and fit the bolt and nut. Torque-tighten the nut to between 80 and 100 lbf in (0.904 and 1.130 mdaN); fit a split pin.

(b) Check that all rotational movement is between the spherical bearing and its housing, not on the bolts and bushes.

E. Install Damper

WARNING: IF THE SPILL DOOR IS INSTALLED ON THE AIRCRAFT, OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

R (1) If applicable (spill door installed), ensure that

the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.

R (2) Before Mod.0420. Install the damper at the centre
R wall position, as follows:-

R (a) Position the damper (with damper bracket attached) in the spill door box.

R (b) Lightly coat, with Aeroshell No.16 grease, the threads of the tension bolts (1), (2) and (3).

R (c) Raise the damper bracket into position; align the holes and insert the two tension bolts (3) and washers into the damper bracket. Do not fully tighten the bolts at this stage.

R (d) Align the four holes in the spill door box with those in the damper bracket; fit the two tension bolts (2) and washers and the two tension bolts (1) and washers. Do not fully tighten the bolts at this stage.

R (e) Torque-tighten the two tension bolts (3) to 70 lbf in (0.791 mdaN). Check that the locking plate can be fitted over the bolt heads. If required, increase the torque loading of the bolts up to 80 lbf in (0.904 mdaN) until the locking plate can be fitted. Fit split pins. Encapsulate the split pins with sealant in accordance with 20-22-19.

R (f) Torque-tighten the two tension bolts (2) to between 70 and 80 lbf in (0.791 and 0.904 mdaN). Interlock the bolts with locking wire in accordance with 20-21-13.

R (g) Torque-tighten the two tension bolts (1) to between 40 and 45 lbf in (0.452 and 0.508 mdaN). Interlock the bolts with locking wire in accordance with 20-21-13.

R (h) Align the holes in the damper eye-end and idler lever and, with a washer under its head, fit the bolt.

R (i) Torque-tighten the bolt to between 165 and 185 lbf in (1.864 and 2.090 mdaN). Lock the bolt head to the lug on the idler lever with locking wire in accordance with 20-21-13.

(j) Encapsulate the heads of the tension bolts (1), (2) and (3) with sealant in accordance with 20-22-19.

(k) Reposition the idler lever, align the holes, insert the bolt (2) and fit the washer and nut.

(l) Torque-tighten the nut to between 110 and 120 lbf in (1.243 and 1.356 mdaN); fit a split pin.

(3) After Mod.0420. Install the damper at the centre wall position, as follows:-

(a) Carry out operations (2)(a) to (j).

(4) At the centre wall position of No.4 intake (irrespective of modification state), connect the vane hinge pin to the splined lever (Ref. Fig. 403), as follows:-

(a) Reposition the splined lever.

(b) Align the master spline of the hinge pin end splines with the master spline in the splined lever.

(c) Engage the splines and push the hinge pin to full engagement in the splined lever.

(d) Position the support plate, packer/shim (2) (if previously removed) and hinge washer; fit the bolts, locking tabs and nuts. Do not tighten the nuts at this stage.

(e) Fit the hinge bolt and torque-tighten it to between 80 and 90 lbf in (0.904 and 1.017 mdaN).

(f) Torque-tighten the nuts on the bolts securing the support plate and hinge washer to between 120 and 140 lbf in (1.356 and 1.582 mdaN). Apply sealant to the nuts and bolt heads in accordance with 20-22-19.

(g) Lock the hinge bolt to both locking tabs with locking wire in accordance with 20-21-13.

(5) Install the damper at the sidewall position, as follows:-

R (a) Carry out operations (2)(a) to (j).

F. Conclusion

(1) If a damper has been installed in the spill door whilst the door was in position on the aircraft, carry out operations (a) to (g).

NOTE: If the spill door is off the aircraft, these operations will be carried out after door installation and adjustment.

(a) Refit the access panels previously removed.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT, THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(b) Remove all tools and equipment from the intake, and ensure that the intake is clean.

(c) Remove the locking pins from the hydraulic selector valves of the four intakes.

(d) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(e) On the intake management panel, proceed as follows:-

e1) Remove the anti-interference plate.

e2) Leave the four RAMP/SPILL MASTER switches at the MAN position.

e3) Set the four HYD switches to "AUTO".

(f) Remove the warning placard from the engine start panel.

(g) Remove the barriers from beneath the spill doors and from the intake entries.

5. 'D' Box De-icing Microswitches and Mounting Bracket (Ref. Fig.405 and 406)

WARNING: IF A MICROSWITCH OR MOUNTING BRACKET IS BEING REMOVED AND INSTALLED WHILST THE ASSOCIATED SPILL DOOR IS INSTALLED ON THE AIRCRAFT, OBSERVE THE WARNING AT THE

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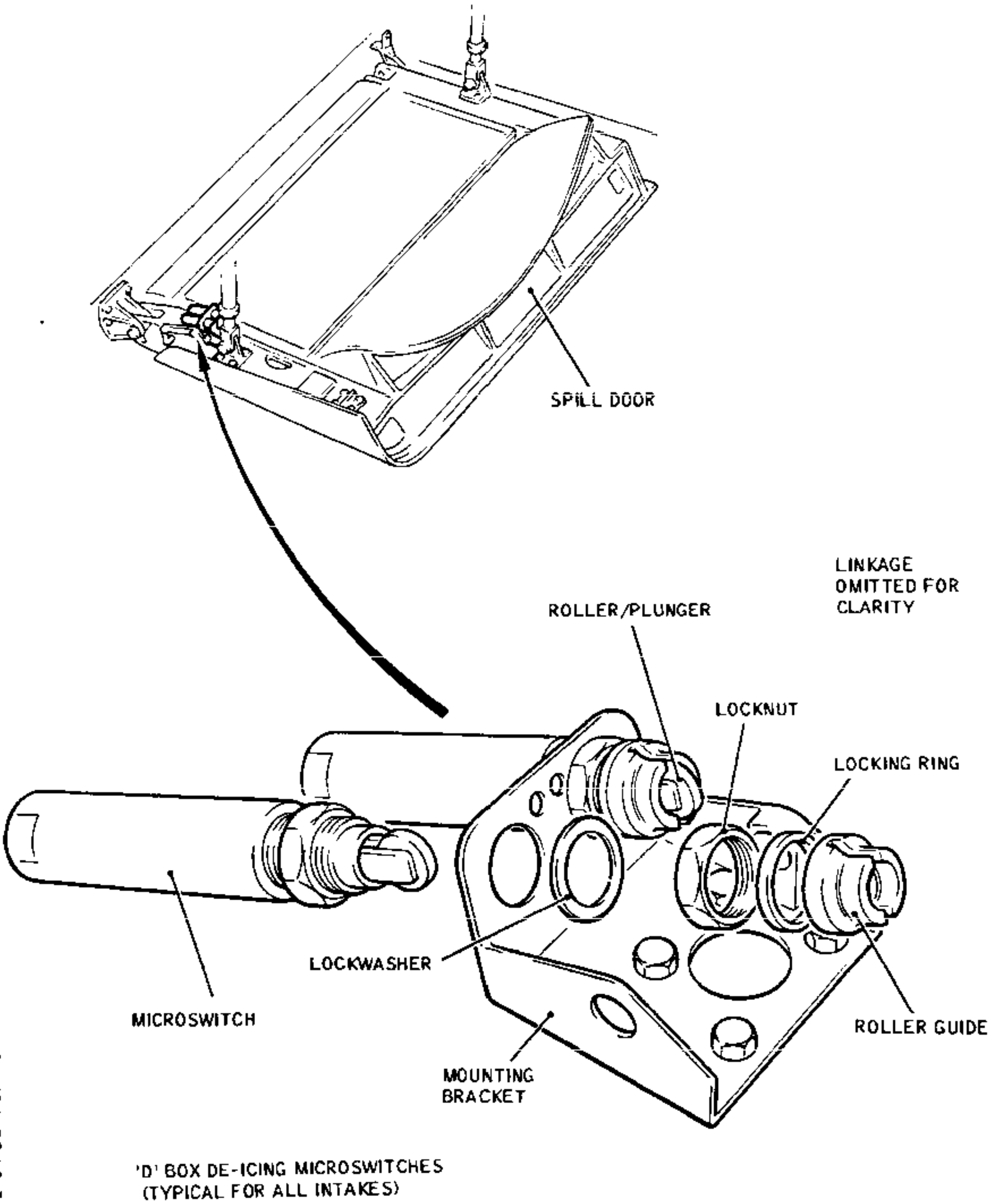

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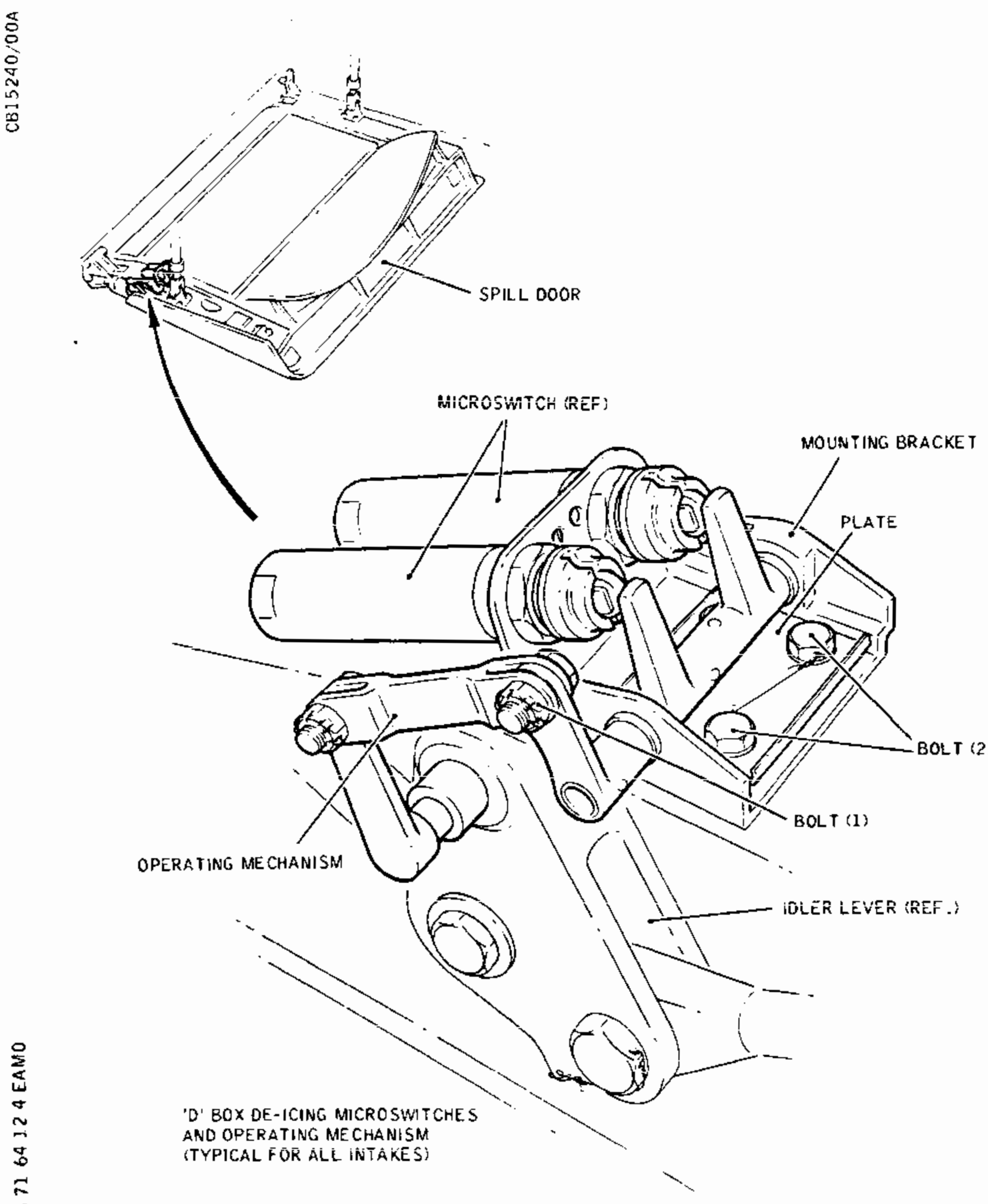
- 'D' Box De-icing Microswitches - Installation
Figure 405



- Microswitch Mounting Bracket - Installation
Figure 406

HEAD OF PAGE 401.

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner, 12 to 15 lbf in (0.136 to 0.169 mdaN)	-
Torque spanner, 35 to 44 lbf in (0.395 to 0.497 mdaN)	-

B. Prepare to Remove Microswitch and Mounting Bracket

(1) If applicable (spill door installed), carry out the procedures detailed in paragraphs 2.B.(2) to (8).

C. Remove Microswitch

(1) Disconnect the electrical cables from the terminal block located on the bottom outer longeron, near the spill door of the appropriate intake.

(2) Loosen the locknut nearest to the plunger.

(3) Loosen the locking ring.

(4) Remove the roller guide, locking ring, locknut and lockwasher.

(5) Withdraw the electrical cables back to the microswitch. Disengage and remove the microswitch from the mounting bracket.

(6) Fit the lockwasher, locknut, locking ring and roller guide to the removed microswitch.

D. Remove Mounting Bracket

(1) Remove the split pin, nut, washer and bolt (1).

(2) Remove the four bolts (2) and washers.

NOTE: Two of the bolts (2) are longer; their position must be recorded for installation purposes.

(3) Remove the plate from the mounting bracket.

(4) Remove the mounting bracket from the spill door.

E. Install Mounting Bracket

(1) Position the mounting bracket on the spill door, and position the plate on the bracket.

(2) Fit the four bolts (2) and washers in the positions recorded on removal.

(3) Torque-tighten the four bolts (2) to between 35 and 44 lbf in (0.395 and 0.497 mdaN). Wire-lock the bolts in accordance with 20-21-13.

(4) Align the holes in the operating mechanism and fit the bolt (1), washer and nut.

(5) Torque-tighten the nut (of bolt (1)) to between 12 and 15 lbf in (0.136 and 0.169 mdaN); fit a split pin.

(6) Encapsulate the heads of the bolts (2) with sealant in accordance with 20-22-19.

F. Install Microswitch

(1) If applicable (spill door installed), ensure that the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.

(2) Remove the roller guide, locking ring, locknut and lockwasher from the microswitch.

(3) Position the microswitch in the mounting bracket; fit the lockwasher, locknut, locking ring and roller guide. Do not tighten the locking ring at this stage.

(4) Route the electrical cables to the appropriate terminal block. Do not connect the cables to the terminal block at this stage.

G. Conclusion

(1) Adjust the microswitch, torque-tighten the locknuts, connect the electrical cables to the terminal block and carry out an Operational Test as detailed in Adjustment/Test.

SPILL DOOR - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

R IN ADDITION, IT MUST BE ENSURED THAT HYDRAULIC POWER
R IS NOT APPLIED TO THE APPROPRIATE MAIN (GREEN OR BLUE)
R SYSTEM AND THE STANDBY (YELLOW) SYSTEM.

1. General
This topic contains the rigging and adjustment procedures and a Functional Test for the spill door, under the following headings:-

Spill Door Rigging (includes pre-loading of push-rods)

Spill Door Vane Downstop Adjustment

'D' Box De-icing Microswitches Adjustment

Spill Door and Vane Clearances

Functional Test

The procedures apply to all intakes, differing only where stated.

Operational and System Tests are not applicable in this instance.

2. Spill Door Rigging

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Protective cover, for intake lip	D926806000
Servicing extension (springboard)	-
Work stand	-
Crawling board	-
Cover, for engine transition ring	D935036001
Torque spanner, 30 to 40 lbf in (0.339 to 0.452 mdaN)	-
Torque spanner, 250 to 650 lbf in (2.825 to 7.345 mdaN)	-
Torque spanner, 600 to 1,200 lbf in (6.780 to 13.560 mdaN)	-
Torque spanner, 1,200 to 1,250 lbf in (13.560 to 14.125 mdaN)	-
Torque spanner, 1,650 to 1,800 lbf in (18.645 to 20.340 mdaN)	-
Torque spanner, 1,700 to 1,850 lbf in (19.210 to 20.905 mdaN)	-
Torque spanner, 2,300 to 2,500 lbf in (25.990 to 28.250 mdaN)	-
Alignment tools, for push-rod eye-end and fork-end	E925059000
Deflection-measuring equipment, for spill door (qty. 2)	E925046000

DESCRIPTION	PART NO.
Support, for spill door when fully open	-
Support, for spill door when 18 deg (approximately) open	-
Support, for spill door when fully closed	-
Angle indicator (or suitable alternative)	D920327000
Never-Seez grease	CM145
Dummy pin, for sidewall push-rod	E925047000

B. Prepare to Rig Spill Door

(1) Defuel the aircraft as detailed in 28-25-00, Servicing, using the pumps.

NOTE: It is not necessary to drain the residual fuel.

(2) Position barriers to prevent persons from inadvertently entering the areas below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel to indicate that work is being carried out on the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

(8) Fully open the appropriate spill door, as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) Remove the locking pin from the hydraulic selector valve associated with the hydraulic system being used and the spill door being operated.

(c) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(d) Make available electrical ground power as detailed in 24-41-00.

(e) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(f) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "OPEN" until the spill door is fully open. Release the switch.

(g) Depressurize the hydraulic system.

(h) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(i) Trip the circuit breaker reset in operation (c) and fit a safety clip.

(j) Refit the locking pin, removed in operation (b), to the selector valve.

(k) Refit, and lock, the anti-interference plate to the intake management panel.

(9) Fit, and secure, the protective cover to the intake lip.

(10) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(11) Place the crawling board on the floor of the intake, aft of the servicing extension.

(12) Fit the cover to the engine transition ring.

(13) Position a support beneath the spill door.

R (14) Remove the appropriate access panel (411 HZ, 421 HZ,
R 431 HZ or 441 HZ) from inside the intake, releasing
R the fasteners in the order stated on the illustration
R (Ref. Removal/Installation, Fig.402).

R (15) Remove the appropriate access panel (411 HL,
R 421 HR, 431 HL or 441 HR) from the intake sidewall.

(16) To protect it from damage, disconnect and remove the connecting rod between the bellcrank lever and the resolver chassis (Ref. 71-64-13, Removal/Installation).

(17) Ensure that the spill door has been correctly installed. Disconnect the push-rods from the bellcrank levers but leave the push-rods connected to the spill door brackets as detailed in Removal/Installation.

<u>NOTE</u>: The spring blade, beneath the head of each 'D' bolt of the centre wall push-rod, must be held pressed against the appropriate fork-end before the 'D' bolt is removed.

(18) Ensure that the push-rods will not foul the structure, etc., when the spill door is moved.

(19) Manually raise the spill door to 18 deg (approximately) open; retain the door in this position on a support.

C. Rig Spill Door (Ref. Fig. 501)

(1) Remove the nuts and bolts securing the upstop (1) to the spill door centre wall position. Remove the upstop (1) and, if fitted, shims.

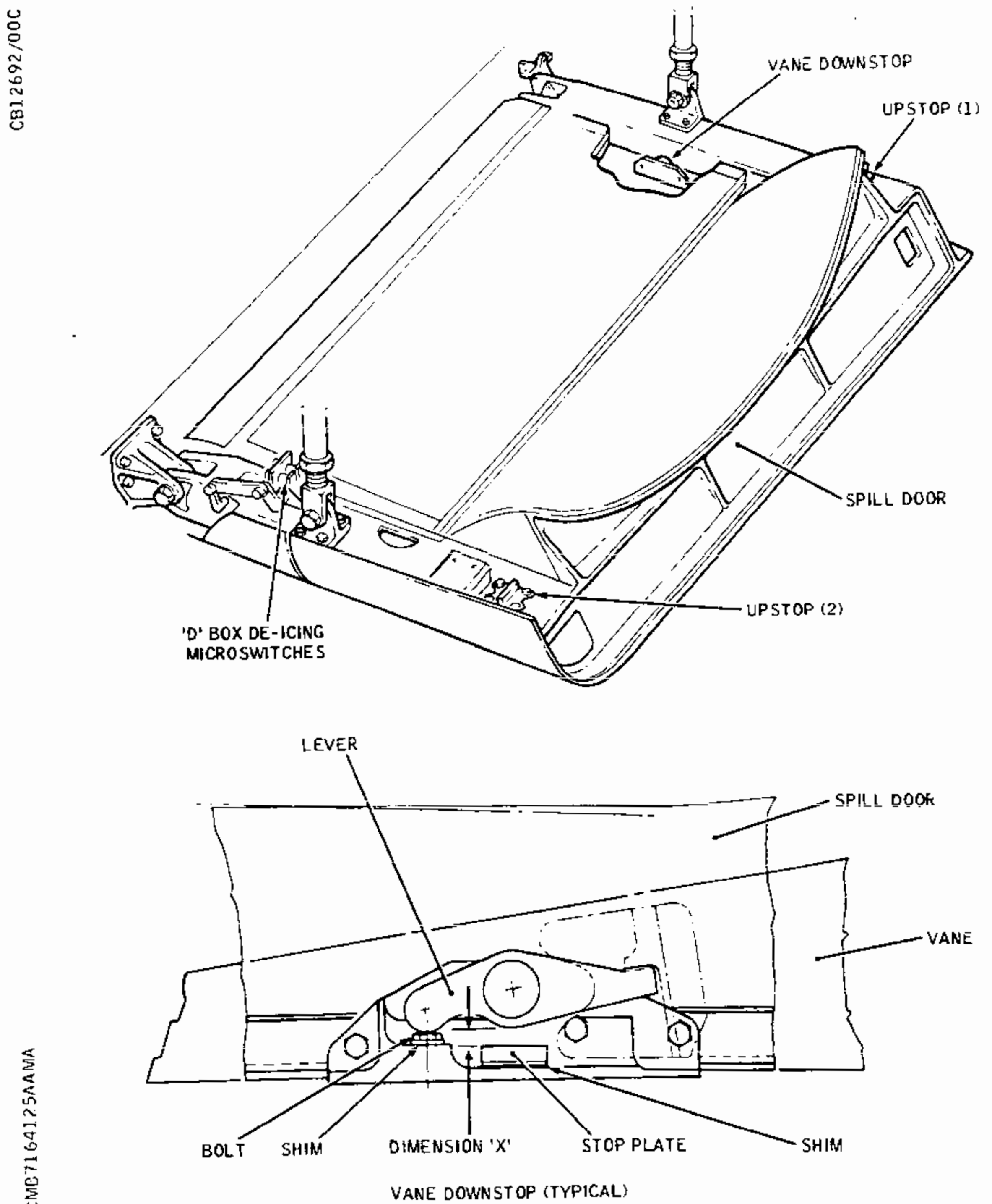
(2) Reassemble the upstop (1) without shims to the spill door; tighten the nuts on the bolts, but do not fit split pins.

<u>NOTE</u>: Use bolts of the correct length, otherwise the nuts may not tighten satisfactorily.

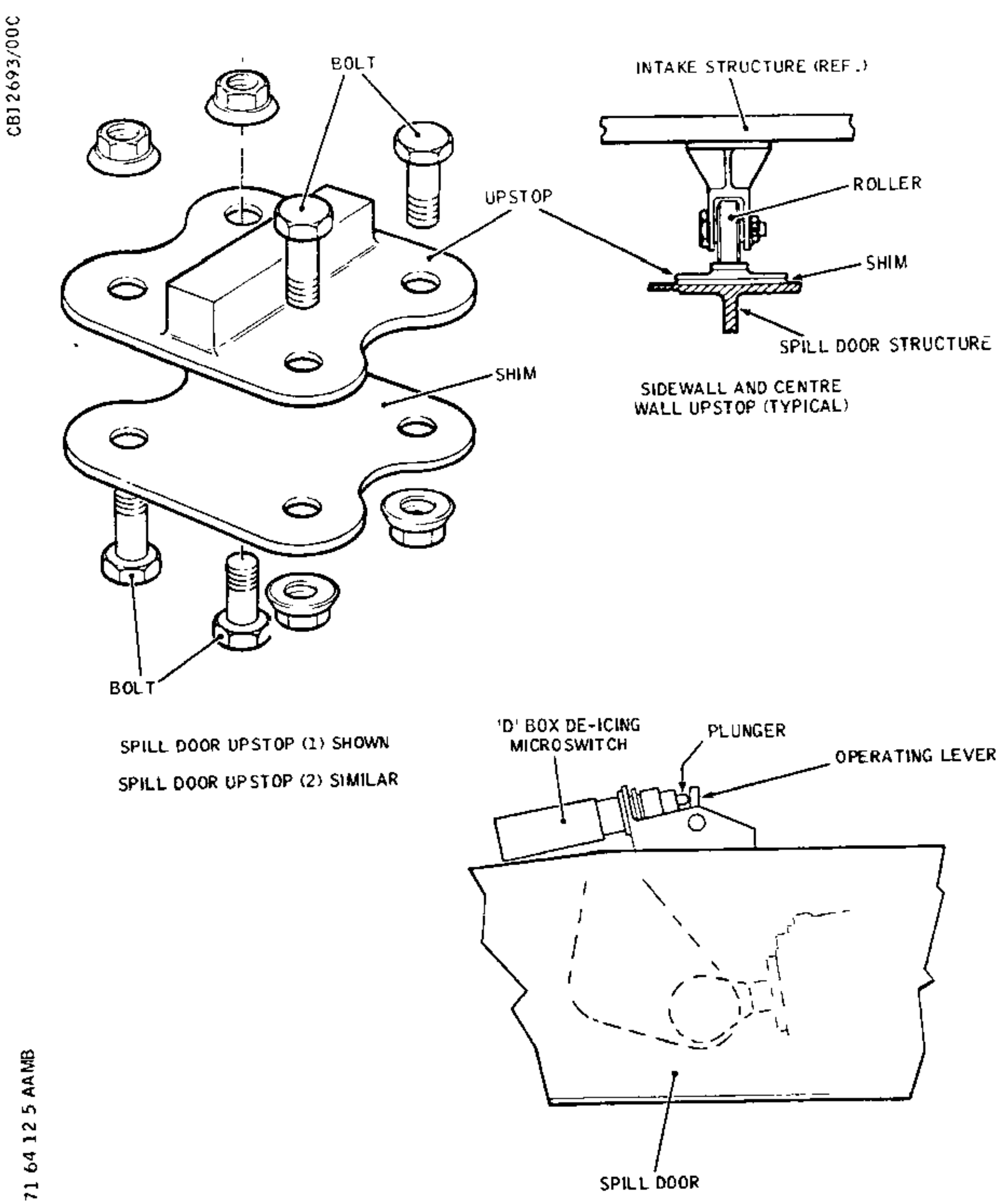
(3) Remove the nuts, bolts, upstop (2) and, if fitted, shims from the spill door sidewall position.

(4) Ensuring that adequate clearances exist around the spill door, manually raise the spill door until the top skin at the aft end of the 'D' box is aligned with the diffuser skin at the centre wall position. Retain the spill door in this position on a support.

(5) Measure the gap between the roller and upstop (1) at the centre wall position. This dimension will



R Rigging References (Sheet 1 of 2)
Figure 501



- Rigging References (Sheet 2 of 2)
Figure 501

R

be the thickness of shim required.

(6) Remove the support and manually lower the spill door to 18 deg (approximately) open; retain the door in this position on a support.

(7) Remove the upstop (1) from the spill door (Ref. para.(1)).

(8) Reassemble the upstop (1) to the spill door, using shims of the thickness determined in operation (5), bolts (of correct length) and nuts.

(9) Torque-tighten the nuts to between 30 and 40 lbf in (0.339 and 0.452 mdaN).

(10) Reassemble the upstop (2) to the spill door sidewall position, using shims totalling 0.10 in (2.54 mm) thickness, bolts (of correct length), and nuts. Tighten the nuts.

(11) Manually raise the spill door until the upstops just contact the upstop rollers; retain the door in this position on a support.

(12) At the sidewall position, measure the difference in levels between the top skin at the aft end of the 'D' box and the diffuser skin.

(13) Remove the support and manually lower the spill door to 18 deg (approximately) open; retain the door in this position on a support.

(14) Remove the upstop (2) and the 0.10 in (2.54 mm) shim, fitted in operation (10), from the spill door sidewall position.

(15) Obtain shims of the required thickness, determined by deducting from 0.10 in (2.54 mm) the measurement obtained in operation (12); the resulting dimension being the thickness of shim required.

(16) Reassemble the upstop (2) to the spill door, using shims of the thickness determined in operation (15), bolts (of correct length) and nuts.

(17) Torque-tighten the nuts to between 30 and 40 lbf in (0.339 and 0.452 mdaN).

(18) Manually raise the spill door until the upstops just contact the upstop rollers; retain the door

in this position on a support.

(19) Check that the top skin at the aft end of the 'D' box and the diffuser skin are aligned over the whole mating face.

(20) If the skins are not aligned, repeat operations (12) to (19) until the setting is correct.

(21) Check that the clearance (gap) between the edges of the spill door sidewall box and nacelle skins (before pre-loading push-rods) is 0.08 in (2.032 mm) minimum and 0.13 in (2.870 mm) maximum.

(22) Remove the support and manually lower the spill door to 18 deg (approximately) open; retain the door in this position on a support.

(23) Remove the support and manually fully open the spill door.

(24) Retain the door in this position on a support.

(25) Fully extend the actuator piston, as follows:-

CAUTION: ENSURE THAT THE PISTON CAN EXTEND WITHOUT FOULING.

(a) According to which hydraulic system is to be used and which spill door actuator is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(b) Remove the locking pin from the hydraulic selector valve associated with the actuator and the hydraulic system being used.

(c) Make available electrical ground power as detailed in 24-41-00.

(d) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(e) At the intake management panel, remove the

anti-interference plate; hold the appropriate SPILL switch at "SHUT" until the actuator piston is fully extended. Release the switch.

(f) Depressurize the hydraulic system.

(g) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(h) Refit the locking pin, removed in operation (b), to the selector valve.

(i) Trip the circuit breaker reset in operation (a) and fit a safety clip.

(j) Refit, and lock, the anti-interference plate.

(26) Check that the eye-ends of the centre wall and sidewall push-rods are aligned for correct engagement into the bellcrank levers.

(27) Manually raise the spill door until the upstops firmly contact the upstop rollers; retain the door in this position on a support.

(28) At the centre wall position, proceed as follows:-

(a) Ensure that both locknuts on the push-rod have been loosened.

(b) Restrain the push-rod ends against turning, by inserting the fork-end and eye-end alignment tools.

(c) Rotate the push-rod body (to lengthen the rod) until the eye-end is positioned in the bellcrank lever and the bolt holes are aligned.

(d) Check that the profile of the spring blade is at an angle of 15 deg (approximately) to the side of the bellcrank lever fork-end.

CAUTION: IN OPERATION (e), ENSURE THAT THE GREASE DOES NOT CONTACT THE PTFE LINING OF THE SPHERICAL BEARING.

(e) Lightly coat the 'D' bolt with Never-Seez grease; press and hold the spring blade flat against the fork-end and insert the 'D' bolt, ensuring that the head is

correctly placed.

(f) Press lightly on the tail of the 'D' bolt, until the bolt just moves; check that the spring blade restricts the bolt movement to not more than 0.10 in (2.54 mm). If movement exceeds 0.10 (2.54 mm), the spring blade is unserviceable, therefore, a serviceable bellcrank lever (including spring blade) must be fitted (Ref. 71-64-14).

(g) Fit the nut to the 'D' bolt.

(h) Ensuring that the push-rod eye-end and fork-end are aligned, tighten the locknuts, but do not wire-lock them at this stage.

(i) Remove the fork-end and eye-end alignment tools.

(29) At the sidewall position, proceed as follows:-

(a) Repeat operations (28)(a), (b) and (c).

(b) Fit the dummy pin in lieu of the bolt at this stage.

(c) Repeat operations (28)(h) and (i).

(30) Remove the support and then open the spill door, as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) Remove the locking pin from the hydraulic selector valve associated with the hydraulic system being used and the spill door being operated.

(c) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(d) Make available electrical ground power as detailed in 24-41-00.

(e) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(f) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "OPEN" until the spill door is 50 per cent (18 deg) (approximately) open. Release the switch.

(g) Depressurize the hydraulic system.

(h) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(i) Trip the circuit breaker reset in operation (c) and fit a safety clip.

(j) Refit the locking pin, removed in operation (b), to the selector valve.

(k) Refit, and lock, the anti-interference plate to the intake management panel.

(l) Position a support beneath the spill door.

CAUTION: IN OPERATION (31), ENSURE THAT THE GREASE DOES NOT CONTACT THE SPHERICAL BEARING PTFE LINING.

(31) At the sidewall position, remove the dummy pin securing the push-rod eye-end to the bellcrank lever and insert the bolt, lightly coated with Never-Seez grease; fit the nut.

CAUTION: IN OPERATION (32), DO NOT UNSCREW THE NUT IN AN ATTEMPT TO FIT THE SPLIT PIN.

THE SPLIT PIN HOLES MUST BE ALIGNED HORIZONTALLY.

(32) At the centre wall position, torque-tighten the nut on the 'D' bolt to 250 lbf in (2.825 mdaN) (minimum value). If a split pin cannot be inserted (i.e., holes not aligned) progressively increase torque to 650 lbf in (7.345 mdaN) (maximum value), checking throughout if a split pin can be inserted.

CAUTION: IN OPERATION (33), THE SPLIT PIN LEGS MUST NOT BE BENT OVER THE END OF THE BOLT.

(33) Fit a split pin (horizontally) to the nut on the 'D' bolt. Turn the split pin legs in opposite directions around the nut; crop the legs and push the end of each leg into a castellation to prevent the split pin from turning.

CAUTION: IN OPERATION (34), DO NOT UNSCREW THE NUT IN AN ATTEMPT TO FIT THE SPLIT PIN.

(34) At the sidewall position torque-tighten the nut on the bolt to 600 lbf in (6.780 mdaN) (minimum value). If a split pin cannot be inserted (i.e., holes not aligned) progressively increase torque to 1,200 lbf in (13.560 mdaN) (maximum value), checking throughout if a split pin can be inserted. Fit a split pin.

(35) Remove the support and then fully open the spill door, as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) Remove the locking pin from the hydraulic selector valve associated with the hydraulic system being used and the spill door being

operated.

(c) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(d) Make available electrical ground power as detailed in 24-41-00.

(e) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(f) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "OPEN" until the spill door is fully open. Release the switch.

(g) Depressurize the hydraulic system.

(h) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(i) Trip the circuit breaker reset in operation (c) and fit a safety clip.

(j) Refit the locking pin, removed in operation (b), to the selector valve.

(k) Refit, and lock, the anti-interference plate to the intake management panel.

(36) Position a support beneath the spill door.

(37) Pre-load the push-rods (Ref. para.D.).

D. Pre-load Push-rods

NOTE: These procedures apply to both the inner and outer intakes; only the spill door deflections (Ref. Table 501) are different.

(1) On each push-rod, suitably mark the eye-end and body, longitudinally, for reference when rotating

the body. The marks must be of a temporary nature (e.g., pencil) and are to be used only for the adjustments to be made in operation (3).

(2) On each push-rod, loosen the locknuts without disturbing the reference marks made in operation (1).

(3) Using the alignment tools to maintain the fork-end and eye-end on each push-rod in absolute alignment, and using the reference marks for indication, rotate (to shorten the rod) each push-rod body alternately in increments of one quarter-turn, until the sidewall body has been turned one half-turn and the centre wall body has been turned one full turn.

(4) With the eye-end and fork-end alignment tools fitted, temporarily tighten the locknuts of both push-rods. Remove the alignment tools.

(5) Attach each deflection measuring equipment to the spill door (one at the sidewall position, the other at the centre wall position), as follows:-

(a) Unscrew the four levelling screws, but do not remove them.

(b) Position the equipment on the door and insert the forward and rear attachment bolts into the anchor nuts in the door.

(c) Tighten both attachment bolts and then unscrew the rear bolt two full turns.

(d) Adjust both front levelling screws and the rear levelling screw next to the vane to draw the equipment away from the door and at the same time level (approximately) the equipment laterally.

(e) Tighten the rear attachment bolt.

(f) Fit the rubber cord assemblies.

(g) Fit a dial test indicator (DTI) at the edge of the equipment nearer to the vane. If possible, position the DTI so that it can be read from outside the door operating area.

(h) Set the DTI to zero.

CAUTION: DURING SUBSEQUENT OPERATIONS, AVOID INADVERTENTLY ALTERING THE DTI READINGS (E.G., BY KNOCKING OR JARRING) OTHERWISE INCORRECT LOADINGS WILL RESULT.

(6) Ensure that the spill door and associated mechanism can be moved without fouling equipment, etc.

(7) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(8) Remove the locking pins from the hydraulic selector valve associated with the hydraulic system being used and the spill door being operated.

(9) Make available electrical ground power as detailed in 24-41-00.

WARNING: AFTER OPERATION (10), HYDRAULIC PRESSURE IS APPLIED ALMOST CONTINUOUSLY AND THE SPILL DOOR IS MOVED SEVERAL TIMES UNTIL THE DTI READINGS ARE SATISFACTORY. THROUGHOUT THIS PERIOD, ALL PERSONS MUST BE EXCLUDED FROM THE INTAKE INTERIOR, AND ALSO (EXCEPT FOR DTI READER) FROM THE IMMEDIATE VICINITY; ADDITIONALLY, THE INTAKE MANAGEMENT PANEL MUST NOT BE LEFT UNGUARDED.

(10) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intake.

(11) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "SHUT" until the spill door is fully shut.

(12) With the hydraulic system still pressurized and the SPILL switch held at "SHUT", stand clear of the spill door opening area (i.e., stand at the side of the door, not beneath it) and accurately record the reading of each DTI.

(13) Using the SPILL switch, partly open and then fully

close the spill door. Accurately record the reading of each DTI with the door fully closed.

(14) Repeat operation (13) until the DTI readings are consistent (i.e., several consecutive readings are the same).

(15) With the hydraulic system pressurized and the SPILL switch held at "SHUT", check that each DTI reads as listed in Table 501 for the appropriate spill door.

SPILL DOOR	POSITION	DTI READING
Inner	Sidewall	0.0135 in (0.3429 mm)
	Centre wall	0.0150 in (0.3810 mm)
Outer	Sidewall	0.0150 in (0.3810 mm)
	Centre wall	0.0165 in (0.4191 mm)

NOTE: All readings have a tolerance of ±0.001 in (±0.0254 mm).

Spill Door Deflections
Table 501

(16) If the DTI readings are as required in Table 501, ignore operations (17) to (19).

(17) If the DTI readings are not satisfactory, note in which direction the deflections require altering (i.e., increase or decrease) then proceed as follows:-

(a) Hold the appropriate SPILL switch at "OPEN" until the spill door is 50 per cent (18 deg) (approximately) open. Release the switch.

(b) Depressurize the hydraulic system.

(c) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(d) Trip the circuit breaker reset in operation (7) and fit a safety clip.

(e) Refit the locking pin, removed in operation (8), to the hydraulic selector valve.

(f) Using the alignment tools to maintain the eye-end and fork-end on each push-rod in alignment, loosen the locknuts.

(g) Rotate the push-rod bodies, as required, in the direction noted.

NOTE: Circumferential movement of a push-rod body, measured at the end-fitting threads, to give a DTI reading change of 0.001 in (0.0254 mm) (approximately) is: sidewall position, 0.150 in (3.81 mm); centre wall position, 0.300 in (7.62 mm).

(18) Remove the alignment tools and then repeat operations (6) to (16).

(19) If the DTI readings are still not as required, repeat operations (17)(a) to (g) and (18).

(20) When the DTI readings are satisfactory, proceed as follows:-

(a) Hold the appropriate SPILL switch at "OPEN" until the spill door is 50 per cent (18 deg) (approximately) open. Release the switch.

(b) Refit, and lock, the anti=interference plate.

(c) Depressurize the hydraulic system.

(d) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(e) Trip the circuit breaker reset in operation (7) and fit a safety clip.

(f) Refit the locking pin, removed in operation (8), to the hydraulic selector valve.

(g) Using the alignment tools to maintain the eye-end and fork-end on the push-rods in absolute alignment, tighten and torque-load the locknuts in accordance with Table 502.

(h) Remove the alignment tools from the push-rods.

(i) Check the alignment of the push-rod ends, as follows:-

i1) Rotate the sidewall push-rod fully in each direction and check that the fork-end abuts its associated spill door bracket at each extremity of travel.

i2) If the fork-end does not abut the bracket, measure the residual gap, which must be no greater than 0.040 in (1.0160 mm).

i3) Repeat operations i1) and i2) on the centre wall push-rod.

(j) Lock the locknuts of both push-rods with locking wire in accordance with 20-21-13.

ITEM	LOCKNUT LOCATION	TORQUE LOADING REQUIRED
Centre wall push-rod	Eye-end	1,650 to 1,800 lbf in (18.645 to 20.340 mdaN)
	Fork-end	1,200 to 1,250 lbf in (13.560 to 14.125 mdaN)
Sidewall push-rod	Eye-end	2,300 to 2,500 lbf in (25.990 to 28.250 mdaN)
	Fork-end	1,700 to 1,850 lbf in (19.210 to 20.905 mdaN)

Push-rod Locknuts Torque Loading
Table 502

(21) Remove the deflection measuring equipment.

(22) Position and connect the connecting rod between the resolver chassis and bellcrank lever as detailed in 71-64-13, Removal/Installation.

(23) Check, and if necessary adjust, the resolver chassis as detailed in 71-64-13, Adjustment/Test.

(24) Check, and if necessary adjust, the setting of the

vane downstops (Ref. para.3.).

(25) Check, and if necessary adjust, the setting of the vane position indicator microswitches as detailed in 71-64-15.

(26) Check, and if necessary adjust, the setting of the 'D' box de-icing microswitches (Ref. para.4.).

(27) Check the spill door/vane clearances (Ref. para.5.).

E. Conclusion

R (1) Remove all sealant from the appropriate access panel (411 HZ, 421 HZ, 431 HZ or 441 HZ), and from the panel recess in the sidewall, taking care to avoid damage.

R (2) Apply a bead of sealant, RTV 733, around the outer edge of the recess, in accordance with 20-25-12.

R (3) Fit the access panel inside the intake, inserting the fasteners in the order stated on the illustration (Ref. Removal/Installation, Fig.402). Torque-tighten the fasteners to between 25 and 30 lbf in (0.282 and 0.339 mdaN).

R (4) Remove the sealant that has exuded from around the edge of the panel.

R (5) Fit all other access panels previously removed.

R (6) Carry out a spill door Functional Test (Ref. para.6.).

3. Spill Door Vane Downstop Adjustment (Ref. Fig. 501)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 501.

A. Equipment and Materials

DESCRIPTION	PART NO.
Support, for spill door when fully closed	-
Support, for vane	E925051000
Locking wire	-

B. Prepare to Adjust Vane Downstop

(1) Carry out operations 2.B.(2) to (13). When carrying out operation 2.B.(8), open the spill door to the 50 per cent (18 deg) (approximately) position.

(2) Disconnect both dampers from their associated idler levers as detailed in Removal/Installation.

C. Adjust Vane Downstop

(1) Fully close the appropriate spill door, as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) Remove the locking pin from the hydraulic selector valve associated with the hydraulic system being used and the spill door being operated.

(c) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.2.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(d) Make available electrical ground power as detailed in 24-41-00.

(e) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(f) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "SHUT" until the spill door is fully closed. Release the switch.

(g) Depressurize the hydraulic system.

(h) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(i) Trip the circuit breaker reset in operation (c) and fit a safety clip.

(j) Refit the locking pin, removed in operation (b), to the selector valve.

(k) Refit, and lock, the anti-interference plate to the intake management panel.

(2) Open and close the vane, checking that it moves smoothly.

(3) Press down on the vane and hold it against both downstop bolts.

(4) Check that the external skin of the vane is flush with the surrounding external skin of the spill door.

(5) If the skins are not flush, proceed as follows:

(a) Note in which direction and by how much the vane downstop bolts need to be adjusted.

(b) Raise the vane to gain access to the downstops. Position a support beneath the vane.

(c) Remove the downstop bolt and shims.

NOTE: This applies to both downstops if necessary.

(d) Adjust the thickness of shims and refit the downstop bolts.

(e) Repeat operations (3) and (4) followed, if necessary, by repeating operations (a), (b), (c) and (d) until the external skins are flush.

(f) Lock the downstop bolts with locking wire in accordance with 20-21-13.

(6) Check that a gap, dimension 'X', (Ref. Fig. 501) of 0.350 in (8.89 mm) exists between the lever and stop plate. If necessary, adjust the thickness of the shims beneath the stop plate to achieve this dimension.

(7) Connect the dampers to their associated idler levers as detailed in Removal/Installation.

(8) Check, and adjust if necessary, the 'D' box de-icing microswitches (Ref. para.4.).

(9) Check, and adjust if necessary, the vane position indicator microswitches as detailed in 71-64-15, Adjustment/Test.

D. Conclusion

(1) Refit the access panels previously removed.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (2), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(2) Remove all tools and equipment from the intake, and ensure that the intake is clean.

(3) Remove the locking pins from the hydraulic selector valves of the four intakes.

(4) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(5) At the intake management panel, proceed as follows:

(a) Remove the anti-interference plate.

(b) Set all HYD switches to "AUTO".

(c) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(6) Remove the warning placard from the engine start panel, and remove the barriers from beneath the spill doors and from the intake entries.

4. 'D' Box De-icing Microswitches Adjustment (Ref. Fig. 501)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

A. Equipment and Materials

DESCRIPTION	PART NO.
Support, for spill door when fully closed	-
Support, for vane	E925051000
Angle indicator (or suitable alternative)	D920327000
Test lamp and battery, (or suitable alternative), (qty. 2)	-
Torque spanner, 12 to 14 lbf in (0.136 to 0.158 mdaN)	Ultra-WB808-6UNC
Torque spanner, 75 to 85 lbf in (0.847 to 0.960 mdaN)	-
Locking wire	-

B. Prepare to Adjust Microswitches

(1) Carry out operations 2.B.(2) to (13). When carrying out operation 2.B.(8), fully close the spill door.

(2) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engines 1, 2, 3 and 4			
WINGS & INTS NORM CONT	15-215	1H1836	D10
WINGS & INTS ALT CONT	15-216	2H1836	E14

(3) Position the support beneath the spill door.

(4) Position one end of the angle indicator in the centre of the vane on the fore-and-aft centre line, and the other end on a suitable fixed structure. Identify the position of the indicator on the vane and structure with marks of a temporary nature (e.g., with pencil), for use if the indicator is inadvertently moved out of position.

C. Adjust Microswitches

CAUTION: ENSURE THAT THE ROLLER ON THE PLUNGER IS VERTICAL BEFORE MOVING THE VANE, OTHERWISE DAMAGE MAY RESULT.

(1) Press down on the vane to ensure that it is fully closed; record the vane angle, shown on the angle indicator.

(2) Open the vane 7.5 deg (relative to the angle recorded in operation (1)); position and adjust the support to retain the vane in this position.

(3) If applicable, disconnect the electrical cables of both microswitches on the spill door from the appropriate terminal block (Ref. Table 503).

(4) Connect a test lamp and battery (or suitable alternative) to each pair of cables disconnected in operation (3).

(5) Adjust each microswitch, in turn, until the roller on the plunger makes just sufficient contact with the lever to cause the associated test lamp to light.

(6) Tighten the locknuts on the microswitches to secure them.

(7) Remove the support and close the vane, checking that both test lights go out.

INTAKE	TERMINAL BLOCK	MICROSWITCH REF.	VANE 'OPEN' TERMINALS
1	UG4213	1H1860	B1 and B6
		1H1861	B2 and B7
2	UG4217	1H1862	B1 and B6
		1H1863	B2 and B7

INTAKE	TERMINAL BLOCK	MICROSWITCH REF.	VANE 'OPEN' TERMINALS
3	UG4221	2H1862 2H1863	B1 and B6 B2 and B7
4	UG4225	2H1860 2H1861	B1 and B6 B2 and B7

NOTE: All terminal blocks are located on the bottom outer longeron of the appropriate intake, near the spill door.

Microswitch Terminals
Table 503

(8) Slowly open the vane; check that both test lamps light when the vane is open 7.5(±0.5) deg.

(9) Close the vane, checking that both test lights go out.

(10) Torque-tighten the microswitch locknuts to between 75 and 85 lbf in (0.847 and 0.960 mdaN).

(11) Repeat operations (8) and (9) to recheck the microswitches.

(12) Interlock each pair of locknuts with wire in accordance with 20-21-13.

(13) Ensure that the roller is vertical (by turning the roller guide); tighten the locking ring against the roller guide.

(14) Remove the test lamps and reconnect the electrical cables to the appropriate terminal block, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(15) Torque-tighten the terminal nuts to between 12 and 14 lbf in (0.136 and 0.158 mdaN) in accordance with 20-27-14.

D. Conclusion

(1) Remove the angle indicator.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (2), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(2) Remove all tools and equipment from the intake, and ensure that the intake interior is clean.

(3) Remove the safety clips and reset the following circuit breakers (Ref. para.B.(2)):-

(a) WINGS & INTS NORM CONT.

(b) WINGS & INTS ALT CONT.

(4) Carry out an Operational Test of the associated wing and intake continuous de-icing system in accordance with 30-11-00, Adjustment/Test.

(5) Remove the locking pins from the hydraulic selector valves of the four intakes.

(6) At the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) Set the four HYD switches to "AUTO".

(c) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(7) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

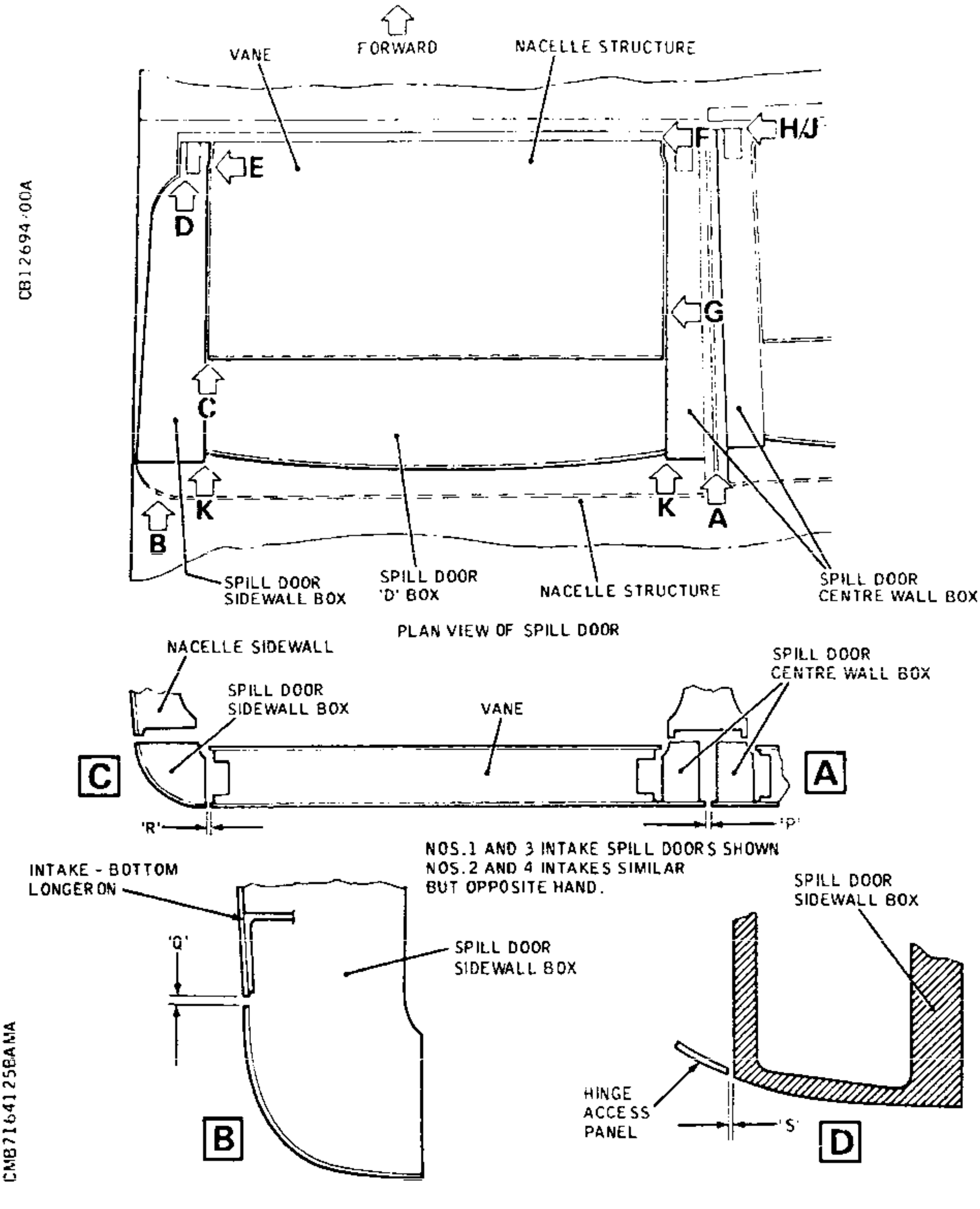
(8) Remove the warning placard from the engine start panel.

(9) Remove the barriers from the intake entries and from beneath the spill doors.

5. Spill Door and Vane Clearances (Ref. Fig. 502)

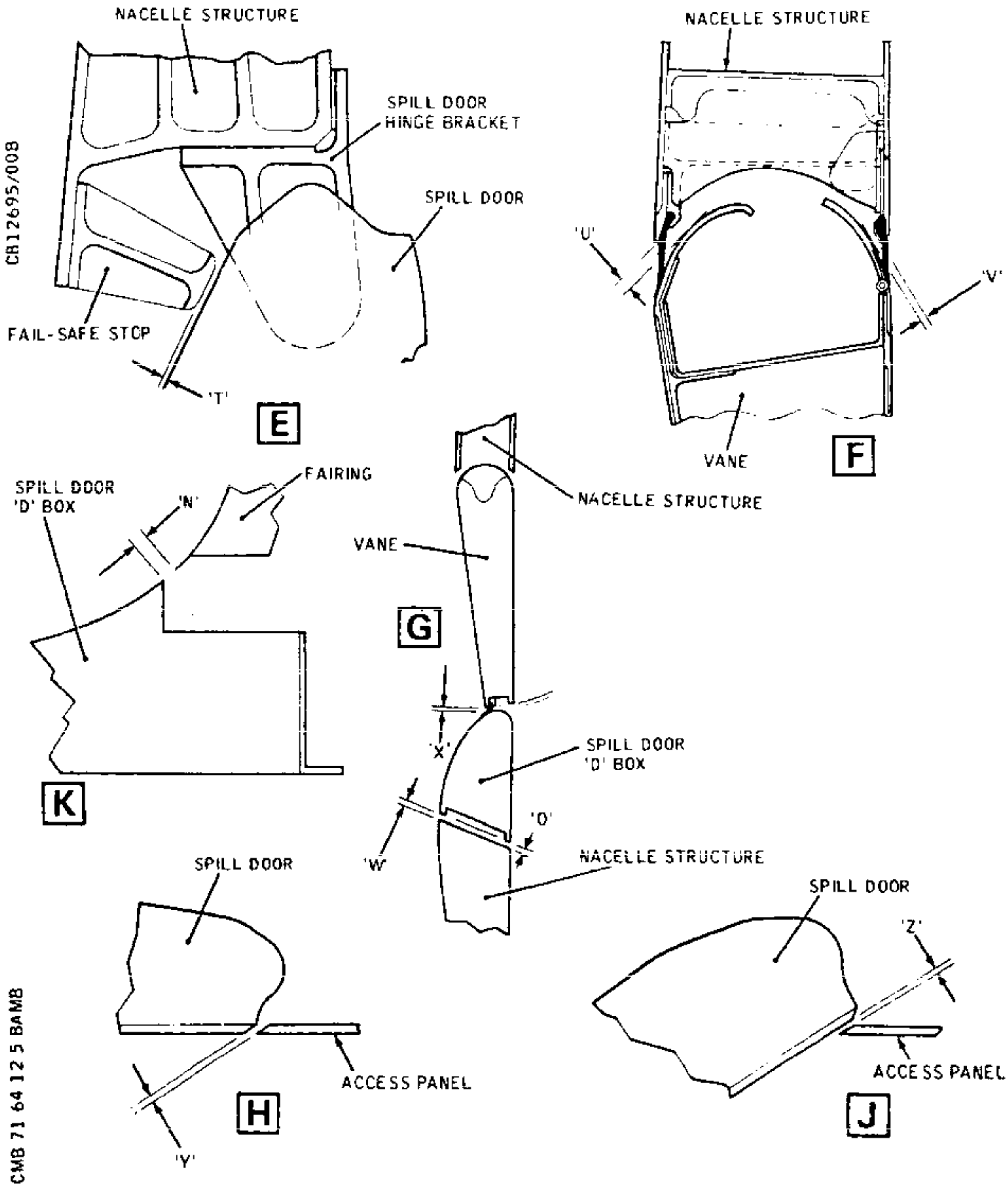
WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 501, AND, ADDITIONALLY, WHEN CHECKING CLEARANCES WITH HYDRAULIC POWER APPLIED, STAND CLEAR OF THE DOOR OPERATING AREA.

NOTE: The majority of clearances are, or can be, checked with



- Spill Door and Vane Clearances (Sheet 1 of 2)
Figure 502

R



- Spill Door and Vane Clearances (Sheet 2 of 2)
Figure 502

R

the spill doors fully closed; therefore, the order of the procedures assumes that the spill doors are closed at the start of these checks.

A. Equipment and Materials

DESCRIPTION	PART NO.
Support, for spill door when fully closed	-

B. Prepare to Check Clearances

(1) Carry out operations 2.B.(1) to (13). When carrying out operation 2.B.(8), fully close the spill door.

(2) Position a support beneath the spill door.

C. Check Clearances

(1) Using the illustration (Ref. Fig. 502) in conjunction with Table 504, check the clearances required at Details A(a), C, D, E(a), G, H and K.

(2) Check the clearances required at Details B and E(b) with the hydraulic system pressurized, as follows:-

WARNING: ENSURE THAT ALL INTAKES ARE CLEAR OF PERSONS, OTHER THAN THE PERSON CHECKING THE CLEARANCE, AND THAT EQUIPMENT IS CLEAR OF MOVING PARTS.

(a) Remove the support from beneath the spill door.

(b) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.2.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(c) Remove the locking pin from the hydraulic selector valve associated with the hydraulic system being used and the spill door being

operated.

(d) Make available electrical ground power as detailed in 24-41-00.

(e) Pressurize fully the appropriate hydraulic system (Ref. Chap.29) with the application of power controlled by a responsible person associated with work on the intakes.

(f) At the intake management panel, remove the anti-interference plate and hold the appropriate SPILL switch at "SHUT".

(g) Standing clear of the door operating area, check the clearances required at Details B and E(b).

(3) Hold the SPILL switch at "OPEN" until the spill door is fully open. Release the switch.

(4) Refit, and lock, the anti-interference plate.

(5) Depressurize the hydraulic system.

(6) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(7) Trip the circuit breaker reset in operation (2)(b) and fit a safety clip.

(8) Refit the locking pin, removed in operation (2)(c), to the selector valve.

CLEARANCE LOCATION	FIG.502 DETAIL	SPILL DOOR/ VANE POSITION	CLEARANCE
Between edges of both spill doors bottom skin at centre wall position	A	(a) Both spill doors closed	'P': Min. 0.08 in (2.032 mm) Max. 0.20 in (5.080 mm)
		(b) Adjoining spill doors in any open configur- ation; nearest	'P': Min. 0.04 in (1.016 mm)

CLEARANCE LOCATION	FIG.502 DETAIL	SPILL DOOR/ VANE POSITION	CLEARANCE
		points of edges	
Between edges of outer skins of spill door sidewall box and nacelle sidewall at bottom longeron	B	Spill door closed normally (i.e., door pre-loaded, using hydraulic power)	'Q': Min. 0.05 in (1.270 mm) Max. 0.10 in (2.540 mm)
Between edges of bottom skins of vane and spill door sidewall box (not centre wall box)	C	Vane closed - spill door open or closed	'R': Min. 0.08 in (2.032 mm) Max. 0.12 in (3.048 mm)
Between edges of hinge access panel and spill door sidewall box	D	Spill door closed	'S': Min. 0.08 in (2.032 mm) Max. 0.20 in (5.080 mm)

**ON A/C 001-001, 003-005,

After SB 54-040 For A.C 001-001,003-005,

Between spill door and fail-safe stop (two each door)	E	(a) Spill door closed (not pre-loaded)	'T': Min. 0.045 in (1.143 mm) Max. 0.055 in (1.397 mm)
		(b) Spill door closed (pre-loaded)	'T: Min. 0.02 in (0.508 mm) Max 0.03 in (0.762 mm)

**ON A/C 002-002, 006-007,

After SB 54-040 For A/C 002-002,006-007,

CLEARANCE LOCATION	FIG.502 DETAIL	SPILL DOOR/ VANE POSITION	CLEARANCE
Between spill door and fail-safe stop (two each door)	E	(a) Spill door closed (not pre-loaded)	'T': Min. 0.08 in (2.032 mm) Max. 0.14 in (3.556 mm)
		(b) Spill door closed (pre-loaded)	'T': Min. 0.06 in (1.524 mm)
Between vane structure and nacelle structure	F	Spill door fully open	'U': Min. 0.05 in (1.270 mm) 'V': Min. 0.05 in (1.270 mm)
Between top skin of spill door 'D' box and nacelle structure	G	Spill door closed	'W': Min. 0.08 in (2.032 mm) Max. 0.17 in (4.318 mm)
Between bottom skin of spill door 'D' box and nacelle structure	G	Spill door closed	'O': Min. 0.05 in (1.270 mm) Max. 0.17 in (4.318 mm)
Between vane bottom skin and spill door 'D' box - operating clearance	G	Spill door open or closed - vane moved through open/ closed cycle	'X': Min. 0.16 in (4.064 mm)
Between access panels on structure (at spill door hinge line) and	H	(a) Spill door fully closed	'Y': Max. 0.18 in (4.572 mm)
spill door/vane	J	(b) Spill door fully open	'Z': Min. 0.06 in (1.524 mm)
Between spill door 'D' box and fixed fairing	K	Spill door closed	'N': Min. 0.06 in (1.524 mm) Max. 0.20 in (5.080 mm)

Spill Door and Vane Clearances
Table 504

(9) Using the illustration (Ref. Fig. 502) in conjunction with Table 504, check the clearances required at Details F, J, and A(b).

WARNING: OPERATION (10) REQUIRES THE ADJOINING SPILL DOORS TO BE MOVED TO VARIOUS DIFFERENT POSITIONS; THEREFORE, ENSURE THAT HYDRAULIC POWER IS SWITCHED OFF BEFORE CHECKING CLEARANCE.

(10) Repeat operations (2)(b) to (e) for the adjoining spill doors. Using the appropriate SPILL switches, set the doors to various different positions, e.g., one door open 10 deg, the other open 20 deg. Switch off hydraulic power; check the clearance required at Detail A(b). Repeat this procedure, setting the spill doors in various positions.

(11) Repeat operations (2)(b) to (f) and (4) to (8), to close each spill door.

D. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (1), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(1) Remove all tools and equipment from the intake, and ensure that the intake interior is clean.

(2) Remove the locking pins from the hydraulic selector valves of the four intakes.

(3) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.2.B.(6) and (7)).

(4) At the intake management panel, proceed as follows:

(a) Remove the anti-interference plate.

(b) Set the four HYD switches to "AUTO".

(c) If applicable, set the four RAMP/SPILL MASTER "MAN".

(5) Remove the warning placard from the engine start panel, and remove the barriers from beneath the spill doors and from the intake entries.

6. Functional Test

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Anti-interference plate, for intake management panel	E925068000
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Angle indicator (or suitable alternative), for measuring spill door angle	D920327000

B. Prepare to Test

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes, particularly when

hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's station to indicate that work is being carried out on the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the hydraulic system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate to the intake management panel.

(5) Fit locking pins (Ref. 71-62-00), to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14

(7) Attach one end of the angle indicator to the spill door, as near as possible to the trailing edge and on a fore-and-aft line at the centre wall position. Attach the other end of the indicator to the intake structure.

C. Test

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(1) Ensure that all equipment is clear of moving parts.

(2) Remove the locking pin from the selector valve associated with the hydraulic system being used and the spill door being tested.

(3) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(4) Make available electrical ground power as detailed in 24-41-00.

WARNING: THE INTAKE MANAGEMENT PANEL MUST NOT BE LEFT UNGUARDED UNTIL THE TEST IS CONCLUDED.

(5) Remove the anti-interference plate from the intake management panel.

(6) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with the test.

(7) Hold the appropriate SPILL switch at "SHUT" until the spill door is fully shut. Check that the position indicator displays 0 per cent. Release the switch. Record the angle indicator reading.

(8) Observing the position indicator, simultaneously start the stopwatch and hold the SPILL switch at "OPEN". Check that the time taken for the indicator to display 100 per cent is between 7.3 and 8.2 s. Check that the spill door moves smoothly throughout its travel. Release the switch. Check that the angle indicator shows that the door has opened 36.5(±0.5)deg.

(9) Simultaneously start the stopwatch and hold the SPILL switch at "SHUT". Check that the time taken for the indicator to display 0 per cent, and for the spill door to shut fully, is between 10.2 and 11.8 s. Check that the spill door moves smoothly throughout its travel. Release the switch.

(10) Depressurize the hydraulic system.

(11) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(12) Refit the locking pin, removed in operation (2), to the selector valve.

D. Conclusion

(1) Remove the angle indicator.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT IN OPERATION (2), THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(2) Remove all tools and equipment from the intake, and ensure that the intake interior is clean.

(3) Remove the locking pins from the hydraulic selector valves of the four intakes.

(4) At the intake management panel, proceed as follows:-

(a) If applicable, remove the anti-interference plate.

(b) Set the four HYD switches to "AUTO".

(c) If applicable, set the four RAMP/SPILL MASTER switches to "MAN".

(5) Remove the safety clips and reset the circuit breakers previously tripped (Ref. para.B.(6)).

(6) Remove the warning placard from the engine start panel.

(7) Remove the barriers from the four intake entries and from beneath the spill doors.

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RESOLVER CHASSIS - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

A resolver chassis is fitted in each intake. Access is gained after removal of a panel from the intake sidewall, above the spill door.

2. Resolver Chassis (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Torque spanner, 25 to 30 lbf in (0.282 to 0.339 mdaN)	-
Torque spanner, 70 to 80 lbf in (0.791 to 0.904 mdaN)	-

B. Prepare

(1) Ensure that the four intakes are clear of personnel and equipment.

(2) Position barriers to prevent persons from inadvertently entering the areas below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's (3CM) station to indicate that work is being carried out inside the engine intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the hydraulic system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins to the spill door hydraulic selector valves of the four intakes (Ref. 71-62-00, Servicing).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) The spill door must be fully open, so, if applicable, proceed as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL

DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Remove the locking pin from the hydraulic selector valve associated with the appropriate spill door and hydraulic system to be used.

(b) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(c) Make available electrical ground power as detailed in 24-41-00.

(d) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(e) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "OPEN" until the spill door is fully open. Release the switch.

(f) Depressurize the hydraulic system.

(g) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(h) Trip the circuit breaker reset in operation (b) and fit a safety clip.

(i) Refit, and lock, the anti-interference plate to the intake management panel.

(j) Refit the locking pin removed in operation (a).

(8) Remove the appropriate access panel, 411 HL, 421 HR, 431 HL or 441 HR, from the intake sidewall.

C. Remove

(1) Remove the split pin, nut, washers and bolt securing the connecting rod to the resolver chassis.

(2) Working through the hole in the sidewall, as required, remove the split pin, nut and washer securing the connecting rod to the bellcrank lever.

(3) Remove the connecting rod from the intake.

(4) Disconnect the electrical connectors from the resolver chassis.

R (5) Remove the three bolts and washers securing the resolver chassis to the intake longeron.

R (6) Supporting the resolver chassis, remove the two
R bolts and washers at the connecting rod end of the chassis.

(7) Remove the resolver chassis from the intake.

D. Install

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

(1) Ensure that the safety precautions taken in operations B.(2) to (6) have not been cancelled.

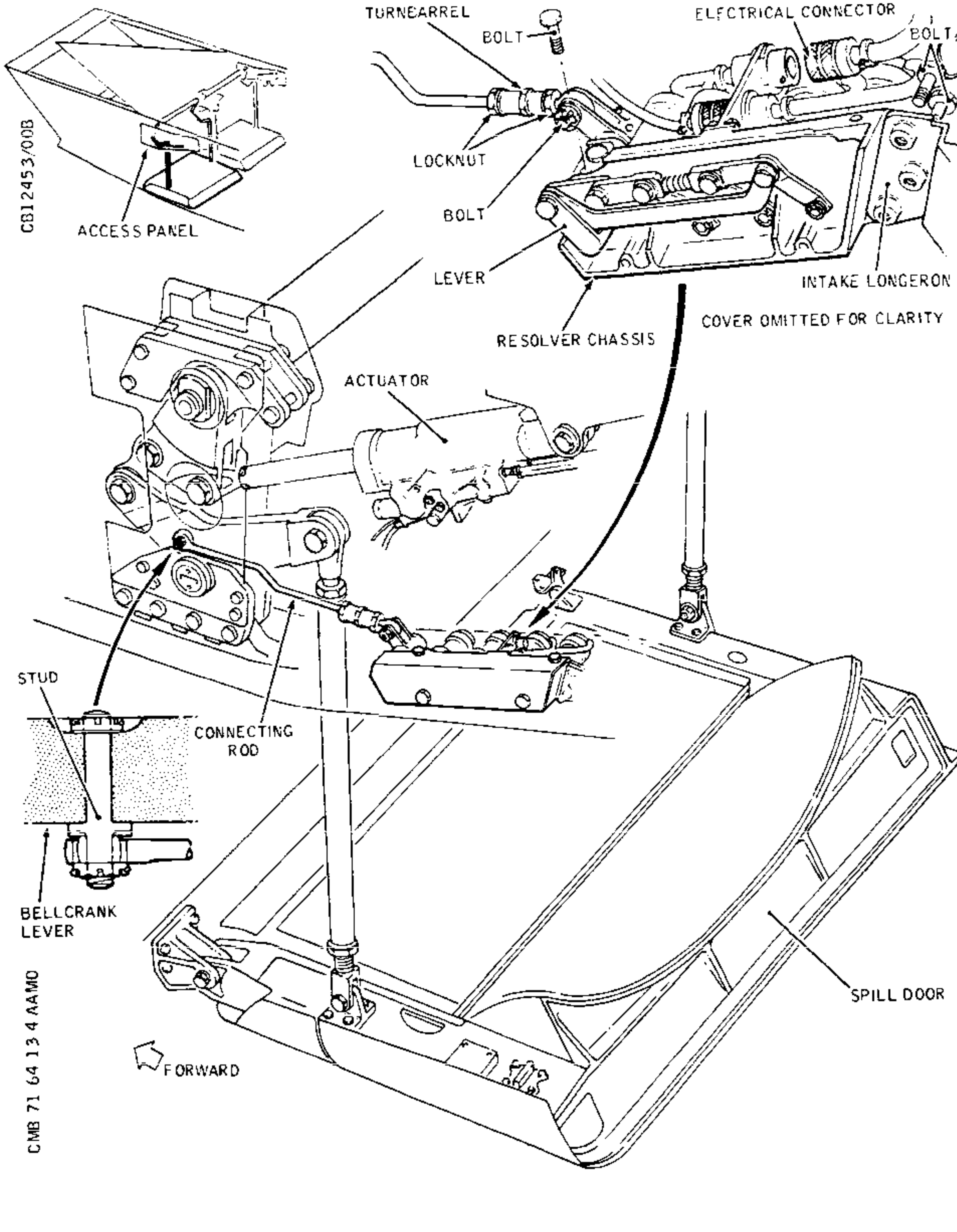
(2) Position the resolver chassis on the intake structure.

(3) Fit the two bolts and washers at the connecting rod end of the chassis, and fit the three bolts and washers at the opposite end.

(4) Torque-tighten each bolt to between 70 and 80 lbf in (0.791 and 0.904 mdaN).

R (5) Position the connecting rod eye-end on the stud in the bellcrank lever and fit the washer and nut.

R (6) Torque-tighten the nut to between 25 and 30 lbf in (0.282 and 0.339 mdaN). Fit a split pin to the nut, bending the split pin legs around the nut, not over the end of the stud.



Resolver Chassis - Installation
Figure 401

R (7) Check that a gap of 0.118 in (3.0 mm) exists between the end of the stud and sideplate.

R (8) Position the connecting rod eye-end in the chassis fork-end; fit the bolt, washers and nut.

R (9) Torque-tighten the nut to between 25 and 30 lbf in (0.282 and 0.339 mdaN) and fit a split pin.

E. Conclusion

(1) Adjust the resolver chassis as detailed in Adjustment/Test.

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RESOLVER CHASSIS - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

A resolver chassis is fitted in each intake. Access is gained after removal of a panel from the appropriate intake sidewall, above the spill door.

Each resolver chassis is electrically adjusted for its associated intake; this adjustment is carried out before the chassis is released for assembly to the aircraft (i.e., during manufacture or overhaul). The final adjustment, required in the following procedures, must be carried out only by adjusting the turnbarrel; the resolvers on the chassis must not be adjusted individually.

This topic contains the adjustment procedures only; for the test requirements, refer to 71-61-00.

2. Resolver Chassis - Adjustment (Ref. Fig. 501)

A. Equipment and Materials

R
DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Anti-interference plate, for intake management panel	E925068000
Support, for spill door when fully closed	-

R

DESCRIPTION	PART NO.
R Resolver test set (includes power loom Pt. No.TE6049201 and spill resolver loom Pt. No.TE6049203)	TE6049000
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Torque spanner, 45 to 50 lbf in (0.508 to 0.565 mdaN)	-
Locking wire	-

B. Prepare

(1) Ensure that the four intakes are clear of personnel and equipment.

(2) Position barriers to prevent persons from inadvertently entering the areas below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel to indicate that work is being carried out inside the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the hydraulic system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins to the spill door hydraulic selector valves of the four intakes (Ref. 71-62-00, Servicing).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Remove the access panel, 411 HL, 421 HR, 431 HL or 441 HR, from the sidewall of the appropriate intake.

(8) Ensure that the appropriate spill door is fully closed, as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Remove the locking pin from the hydraulic selector valve associated with the spill door and the system being used.

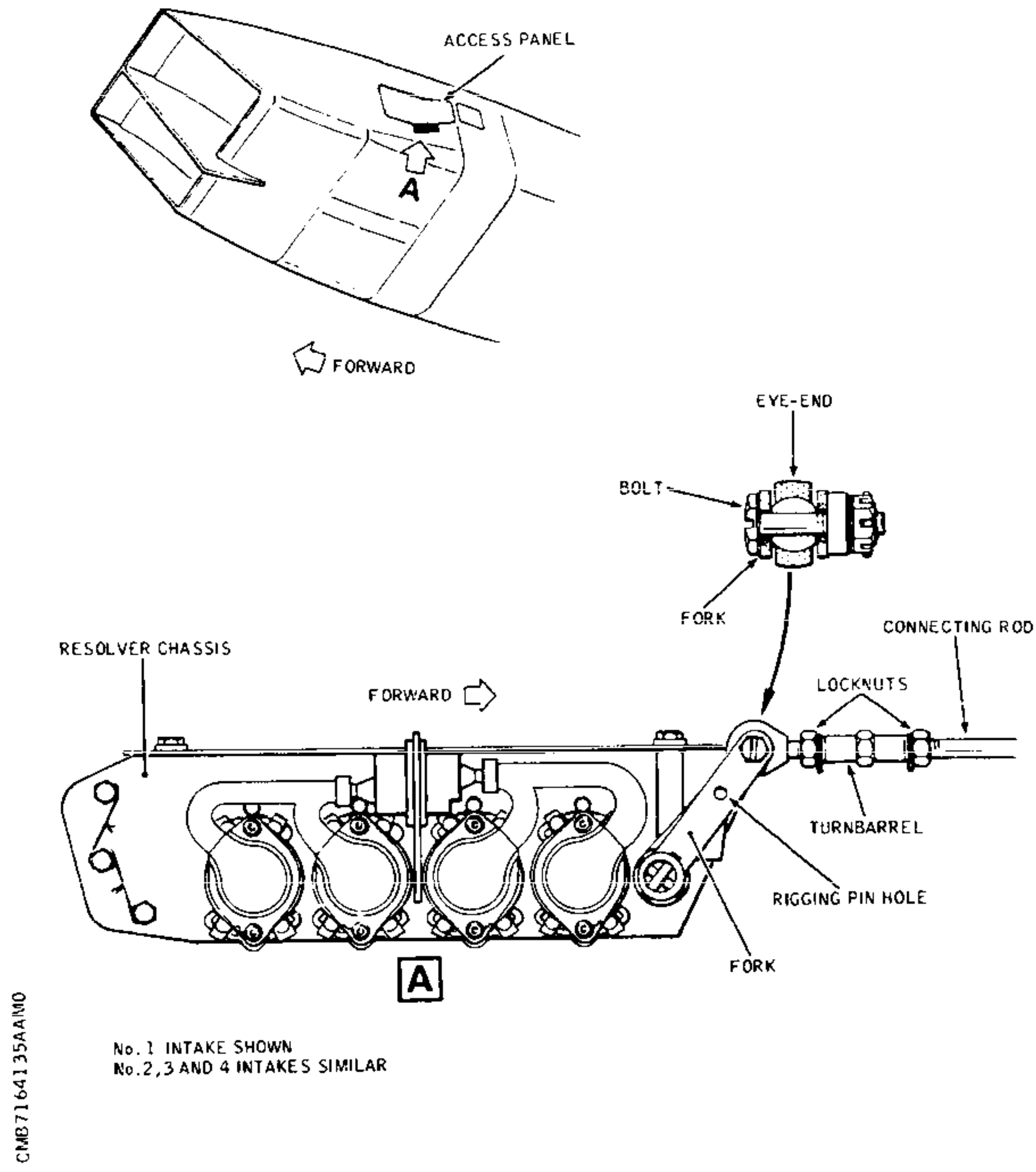
(b) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(c) Make available electrical ground power as detailed in 24-41-00.

(d) Pressurize the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.



Resolver Chassis - Adjustment
Figure 501

(e) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "SHUT" until the spill door is fully closed. Release the switch.

(f) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(g) Depressurize the hydraulic system.

(h) Trip the circuit breaker reset in operation (b) and fit a safety clip.

(i) Refit the locking pin, removed in operation (a), to the hydraulic selector valve.

(j) Refit, and lock, the anti-interference plate to the intake management panel.

(9) Position the support beneath the spill door.

C. Adjust Resolver Chassis

CAUTION: THE CONNECTING ROD FITTED BETWEEN THE BELLCRANK LEVER AND THE RESOLVER CHASSIS CAN BE EASILY DAMAGED (E.G., BENT), THEREFORE, AVOID PLACING ANY LOAD UPON IT.

(1) Disconnect the electrical connectors from the resolver chassis.

R (2) Connect the resolver test set as follows:-

R (a) Ensure that the ON - OFF switch on the test
R set is at the OFF position.

R (b) Connect the appropriate end of the power loom
R to the connector PL1 on the test set and
R connect the other end to a 115 V 400 Hz
R electrical supply.

R (c) Connect the single end of the spill resolver
R loom to the connector PL2 on the test set and
R connect the two tails to their connectors on the
R chassis in accordance with the label attached to
R each tail.

R (d) On the test set, set the RESOLVER SELECT switch
R to "MAIN CONTROL".

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R R (e) Set the ON - OFF switch to "ON"; check that the angle position indicator is illuminated.

NOTE: Operations (3) to (5) are not necessary if the rigging pin holes are aligned, but do not insert a rigging pin.

(3) Loosen the turnbarrel locknuts.

(4) Adjust the turnbarrel until the rigging pin holes are aligned.

CAUTION: DO NOT INSERT A RIGGING PIN.

(5) Ensuring that the side faces of the eye-ends of the connecting rod are parallel, torque-tighten the turnbarrel locknuts to between 45 and 50 lbf in (0.508 and 0.565 mdaN). Do not wire-lock the locknuts at this stage.

(6) Remove the support from beneath the spill door.

(7) Preload the spill door as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Remove the locking pin from the hydraulic selector valve associated with the spill door and the system being used.

(b) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(c) Make available electrical ground power as

detailed in 24-41-00.

(d) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

WARNING: DO NOT LEAVE THE PANEL UNGUARDED UNTIL THE TEST IS CONCLUDED.

(e) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "SHUT" until the spill door is fully closed. Release the switch.

(8) With the hydraulic system still pressurized, hold the appropriate SPILL switch at "SHUT". With the RESOLVER SELECT switch set, in turn, to "MAIN CONTROL", "MAIN MONITOR", "ALT CONTROL" and "ALT MONITOR", check that the test set readings for all resolvers in the same intake agree with those listed in Table 501. If the test set readings are satisfactory, ignore operation (9) and continue with operations (10) to (15).

INTAKE	TEST SET READING
1 or 3	60 deg 12(+10 -0) min
2 or 4	29 deg 48(+0 -10) min

Resolver Signals
Table 501

(9) If the test set readings are not satisfactory, proceed as follows:

(a) Note by how much the reading requires to be altered.

(b) Depressurize the hydraulic system.

(c) Position the support beneath the spill door.

(d) Trip the circuit breaker reset in operation (7)(b) and fit a safety clip.

(e) Refit the locking pin, removed in operation (7)(a), to the hydraulic selector valve.

(f) Loosen the turnbarrel locknuts.

(g) Adjust the turnbarrel by the amount determined in operation (a).

NOTE: A one-third (i.e., two flats of the hexagon) rotation of the turnbarrel will give 1 deg (approximately) movement of the resolver shaft, via the fork.

(h) Repeat operations (5) to (8).

(10) Depressurize the hydraulic system.

R (11) Trip the circuit breaker reset in operation (7)(b) and fit a safety clip.

(12) Refit the locking pin, removed in operation (7)(a), to the hydraulic selector valve.

R (13) Switch off the resolver test set and then disconnect
R it from the resolver chassis.

(14) Connect the electrical connectors to the resolver chassis, ensuring that the mating surfaces are clean and undamaged.

(15) Lock the turnbarrel locknuts to the lockwashers with locking wire in accordance with 20-21-13.

E. Conclusion

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT, THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(1) Remove all tools and equipment from the intake, and ensure that the intake is clean.

(2) Remove the locking pins from the main and standby hydraulic selector valves of the four intakes.

(3) Remove the safety clips and reset the circuit breakers previously tripped (Ref. para.B.(6)).

(4) Refit the access panels previously removed.

(5) On the intake management panel, proceed as follows:

(a) Remove the anti-interference plate.

(b) Leave the four RAMP/SPILL MASTER switches at the MAN position.

(c) Set the four HYD switches to "AUTO".

(6) Remove the warning placard from the engine start panel.

(7) Remove the barriers from beneath the spill doors and from the intake entries.

(8) Carry out the appropriate Preliminary Test as detailed in 71-61-00, Adjustment/Test, '3. Operational Test (Excluding Ramp Manual Inching, Spill Door Manual Inching and Auxiliary Inlets)'.

END OF THIS SECTION

NEXT

SPILL DOOR ACTUATION MECHANISM - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 and 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

R IN ADDITION, IT MUST BE ENSURED THAT HYDRAULIC POWER
R IS NOT APPLIED TO THE APPROPRIATE MAIN (GREEN OR BLUE)
R SYSTEM AND THE STANDBY (YELLOW) SYSTEM.

1. General

This topic details the procedures for the removal and installation of the spill door push-rods and the actuation mechanisms under the following headings:-

Sidewall push-rod

Centre wall push-rod

Sidewall actuation mechanism

Centre wall actuation mechanism

Removal of a sidewall mechanism requires the prior removal of the associated spill door actuator and the disconnection of the push-rods from the bellcrank levers. The removal of a centre wall actuation mechanism requires the prior removal of the associated sidewall actuation mechanism. On installation, the centre wall mechanism must be fitted before the sidewall mechanism.

2. Sidewall Push-rod (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Anti-interference plate, for intake management panel	E925068000
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Protective cover, for intake lip	D926806000
Servicing extension (springboard)	-
Work stand	-
Crawling board	-
Cover, for engine transition ring	D935036001
Torque spanner, 60 to 70 lbf in (0.678 to 0.791 mdaN)	-
Torque spanner, 600 to 1,200 lbf in (6.780 to 13.560 mdaN)	-
Alignment tools, for push-rod eye-end and fork-end	E925059000
Support, for spill door when 18 deg (approximately) open	-
Never-Seez grease	CM145

B. Prepare

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel to indicate that work is being carried out inside the engine intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the hydraulic system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4) and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

(8) Open the appropriate spill door, as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED,
R EXCEPT THE PIN REMOVED AND THE CIRCUIT
R BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) Remove the locking pin from the hydraulic selector valve associated with the spill door and the hydraulic system to be used.

(c) According to which hydraulic system is to be used and which spill door is being operated,
R remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

R INT (1, 2, 3 or 4) ST'BY HYD SUP.

(d) Make available electrical ground power as detailed in 24-41-00.

(e) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(f) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "OPEN" until the spill door is approximately 50 per cent (18 deg) open. Release the switch.

(g) Depressurize the hydraulic system.

(h) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(i) Trip the circuit breaker reset in operation (c) and fit a safety clip.

(j) Refit the locking pin, removed in operation (b), to the selector valve.

(k) Refit, and lock, the anti-interference plate to the intake management panel.

(9) Fit, and secure, the protective cover to the intake lip.

(10) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(11) Place the crawling board on the floor of the intake, aft of the servicing extension.

(12) Position a support beneath the spill door.

R (13) Remove the appropriate access panel (411 HL, 421 HR,
R 431 HL, or 441 HR) from the intake sidewall.

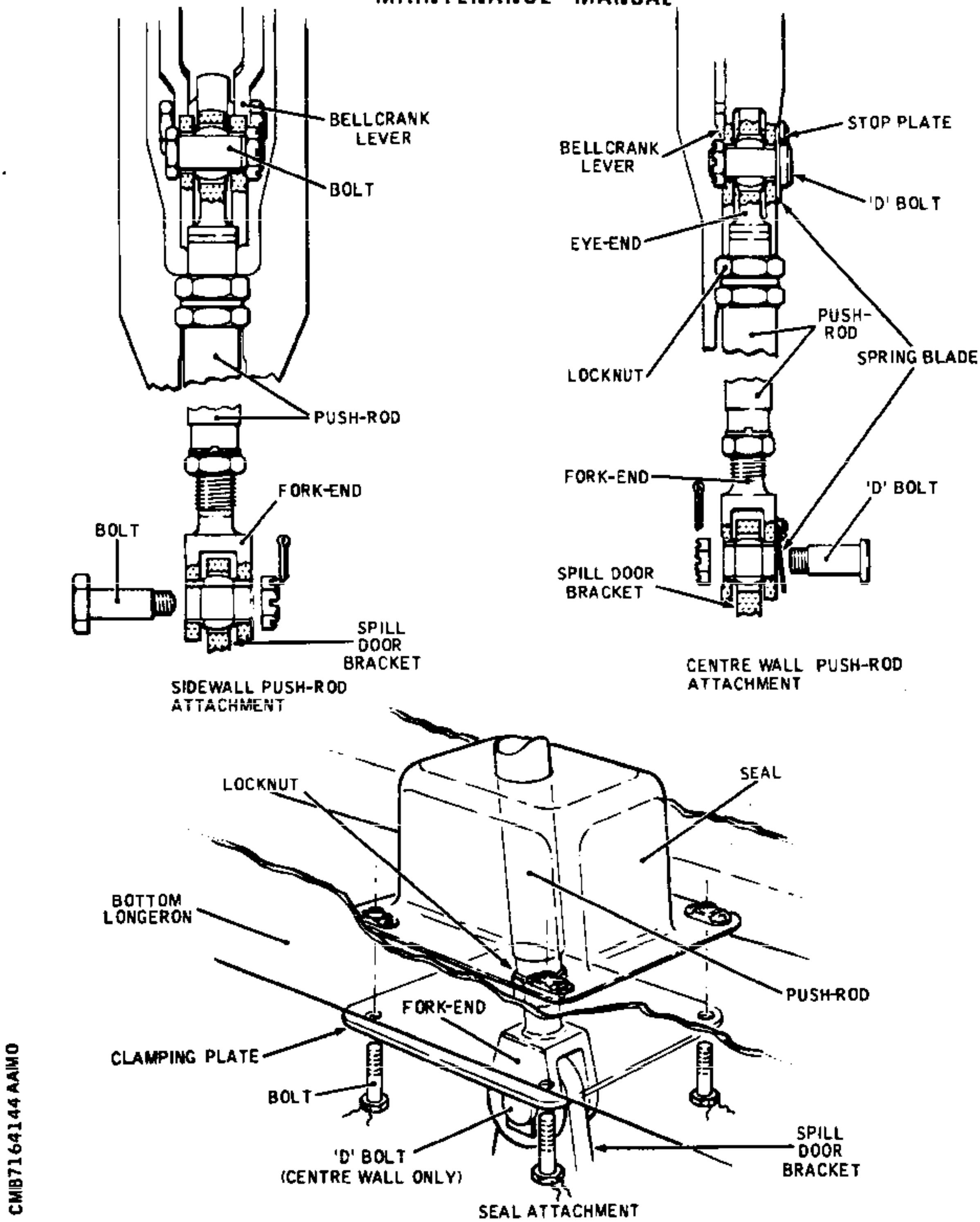
C. Remove Sidewall Push-rod

(1) To protect it from damage, disconnect and remove the connecting rod from between the resolver chassis and the bellcrank lever as detailed in 71-64-13.

(2) Remove the split pin and loosen the nut on the bolt connecting the push-rod to the spill door bracket.

(3) Remove the split pin and loosen the nut on the bolt connecting the push-rod to the bellcrank lever.

(4) Ensuring that the eye-end and the fork-end are restrained against any load being transferred to the bellcrank lever and door bracket, loosen the



Push-rods - Installation
Figure 401

locknuts on the push-rod.

(5) Remove the nuts from the bolts.

(6) If the two bolts can be easily moved, remove them. If the bolts cannot be easily removed, carry out operation (7).

R (7) Using the alignment tools to maintain the eye-end and fork-end in alignment, rotate the push-rod body (to increase rod length) until the two bolts can be easily moved, indicating that the push-rod is in a
R 'no-load' condition. Ensure that the spill door
R is supported and then remove the bolts.

R (8) Remove the alignment tools.

(9) Unscrew the eye-end from the push-rod and remove the push-rod, through the seal.

(10) Screw the eye-end into the push-rod.

D. Install Sidewall Push-rod

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

(1) Ensure that the safety precautions taken in
R operations B.(2) to (7) have not been cancelled.

(2) Remove the push-rod eye-end. Insert the push-rod through the seal. Refit the push-rod eye-end and screw in both ends of the rod to their full extent.

R CAUTION: IN OPERATION (3), ENSURE THAT THE GREASE DOES
R NOT CONTACT THE PTFE LINING OF THE SPHERICAL
R BEARING.

R (3) Position the push-rod fork-end on the door bracket; lightly coat the bolt with Never-Seez grease, insert the bolt and fit the nut.

R CAUTION: IN OPERATION (4) DO NOT UNSCREW THE NUT IN AN ATTEMPT TO FIT THE SPLIT PIN.

R (4) Torque-tighten the nut to 600 lbf in (6.780 mdaN)
R (minimum value). If the split pin cannot be inserted
R (i.e., holes not aligned), progressively increase
R torque to 1,200 lbf in (13.560 mdaN) (maximum value),
R checking throughout if the split pin can be inserted.
R When the holes are aligned, fit the split pin.

E. Conclusion

(1) Rig the spill door and pre-load the push-rods as detailed in 71-64-12, Adjustment/Test.

(2) Fit the resolver chassis connecting rod in accordance with 71-64-13, Removal/Installation.

(3) Check, and adjust if necessary, the setting of the vane position indicator microswitches as detailed in 71-64-15, Adjustment/Test.

(4) Check, and adjust if necessary, the spill door position indicator resolver setting as detailed in 71-64-16, Adjustment/Test.

(5) Check, and adjust if necessary, the resolver chassis setting as detailed in 71-64-13, Adjustment/Test.

(6) Carry out a spill door Functional Test as detailed in 71-64-12, Adjustment/Test.

3. Centre Wall Push-rod (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Anti-interference plate, for intake management panel	E925068000
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Protective cover, for intake lip	D926806000
Servicing extension (springboard)	-
Work stand	-
Crawling board	-
Cover, for engine transition ring	D935036001
Torque spanner, 250 to 650 lbf in (2.825 to 7.345 mdaN)	-

DESCRIPTION	PART NO.
Alignment tools, for push-rod eye-end and fork-end	E925059000
Support, for spill door when 18 deg (approximately) open	-
Never-Seez grease	CM145

B. Prepare

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

(1) Carry out operations 2.B.(1) to (13).

R (2) Remove the appropriate access panel (411 HZ, 421 HZ,
R 431 HZ or 441 HZ) from inside the intake, releasing
R the fasteners in the order shown on the illustration
R (Ref. Fig. 404).

C. Remove Centre Wall Push-rod

(1) Remove the split pin and loosen the nut on the 'D' bolt connecting the push-rod to the spill door bracket.

(2) Remove the split pin and loosen the nut on the 'D' bolt connecting the push-rod to the bellcrank lever.

(3) Ensuring that the eye-end and the fork-end are retrained against any load being transferred to the bellcrank lever and door bracket, loosen the locknuts on the push-rod.

(4) Remove the nuts from the 'D' bolts.

(5) In turn, press and hold each spring blade flat against the associated fork-end and remove the 'D' bolt. If If either bolt cannot be easily removed, carry out operation (6).

(6) Using the alignment tools to maintain the eye-end and fork-end in alignment, rotate the push-rod body (to increase rod length) until the 'D' bolts can be easily moved, indicating that the push-rod is in a

'no-load' condition. Ensure that the spill door is supported and then remove the bolts.

(7) Remove the alignment tools.

(8) Unscrew the eye-end from the push-rod and remove the push-rod.

(9) Screw the eye-end into the push-rod.

D. Prepare to Install Centre Wall Push-rod

(1) Check the spring blade on the bellcrank lever fork-end and on the push-rod fork-end, as follows:-

(a) Check that the profile of the spring blade is at an angle of 15 deg (approximately) to the side of the fork-end.

(b) Press and hold the spring blade flat against the fork-end; insert the 'D' bolt, ensuring that the head is correctly positioned.

(c) Press lightly on the tail of the 'D' bolt until the bolt just moves; check that the spring blade restricts the bolt movement to not more than 0.10 in (2.54 mm). If movement exceeds 0.10 in (2.54 mm), the spring blade is unserviceable, therefore, a serviceable bellcrank lever or push-rod (as appropriate) must be obtained.

E. Install Centre Wall Push-rod

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

(1) Ensure that the safety precautions taken in operations B.(2) to (7) have not been cancelled.

CAUTION: IN OPERATION (2), ENSURE THAT THE GREASE DOES NOT CONTACT THE PTFE LINING OF THE SPHERICAL BEARING.

(2) Lightly coat the 'D' bolt with Never-Seez grease. Position the push-rod fork-end on the door bracket; press and hold the spring blade flat against the fork-end, insert the 'D' bolt, ensuring that the bolt head is correctly placed, and fit the nut.

CAUTION: IN OPERATION (3), DO NOT UNSCREW THE NUT IN AN ATTEMPT TO FIT THE SPLIT PIN.

THE SPLIT PIN HOLES MUST BE ALIGNED HORIZONTALLY.

(3) Torque-tighten the nut to 250 lbf in (2.825 mdaN) (minimum value). If the split pin cannot be inserted horizontally (i.e., holes not aligned), progressively increase torque to 650 lbf in (7.345 mdaN) (maximum value), checking throughout if the split pin can be inserted.

CAUTION: IN OPERATION (4), THE SPLIT PIN LEGS MUST NOT BE BENT OVER THE END OF THE BOLT.

(4) When the holes are aligned, fit a split pin (horizontally) to the nut on the 'D' bolt. Turn the split pin legs in opposite directions around the nut, crop the legs and push the end of each leg into a castellation to prevent the split pin from turning.

F. Conclusion

(1) Rig the spill doors and pre-load the push-rods as detailed in 71-64-12, Adjustment/Test.

(2) Check, and adjust if necessary, the setting of the vane position indicator microswitches as detailed in 71-64-15, Adjustment/Test.

(3) Check, and adjust if necessary, the spill door position indicator resolver setting as detailed in 71-64-16, Adjustment/Test.

(4) Check, and adjust if necessary, the resolver chassis setting as detailed in 71-64-13, Adjustment/Test.

(5) Carry out a spill door Functional Test as detailed in 71-64-12, Adjustment/Test.

4. Sidewall Actuation Mechanism (Ref. Fig. 402)

A. Equipment and Materials

DESCRIPTION	PART NO.
Support, for spill door when fully open	-
Torque spanner, 31 to 40 lbf in (0.350 to 0.452 mdaN)	-

DESCRIPTION	PART NO.
Torque spanner, 62 to 71 lbf in (0.701 to 0.802 mdaN)	-
Torque spanner, 71 to 80 lbf in (0.802 to 0.904 mdaN)	-
Torque spanner, 142 to 160 lbf in (1.605 to 1.808 mdaN)	-
Torque spanner, 124 to 142 lbf in (1.401 to 1.605 mdaN)	-
Torque spanner, 55 to 66 lbf in (0.621 to 0.746 mdaN)	-
Torque spanner, 276 to 316 lbf in (3.119 to 3.570 mdaN)	-
Torque spanner, 245 to 270 lbf in (2.768 to 3.051 mdaN)	-
Torque spanner, 400 to 425 lbf in (4.520 to 4.802 mdaN)	-
Torque spanner, 600 to 1,200 lbf in (6.780 to 13.560 mdaN)	-
Torque spanner, 2,800 to 3,000 lbf in (31.640 to 33.900 mdaN)	-
R Torque adapter	E925188100
Never-Seez grease	CM145
Locking wire	-

B. Prepare

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

(1) Carry out operations 2.B.(1) to (13).

(2) To protect it from damage, disconnect and remove the connecting rod from between the resolver chassis and the bellcrank lever as detailed in 71-64-13.

(3) Remove the spill door actuator as detailed in 71-64-11.

(4) Remove the split pins, nut and bolts securing the push-rods to the bellcrank levers.

(5) Manually, fully open the door and rest it on a support.

C. Remove Sidewall Actuation Mechanism

NOTE: The inner sideplate is part of the sidewall structure and is not removed.

(1) Remove the bolts and disconnect the clips of the flexible electrical conduits attached to the actuation mechanism and stow them clear of the mechanism.

(2) Remove the nuts, washers and bolts (3) securing the outer sideplate to the web.

(3) Remove the bolts, washers, locking plate, ringnut and thrust washer.

(4) Remove the bolts (1) and (7) and washers securing the outer sideplate to the structure.

(5) Remove the bolts (2) and washers, and bolts (5) and washers from the top fitting and outer sideplate.

(6) Remove the bolts (4) and washers (if fitted) from the sideplate.

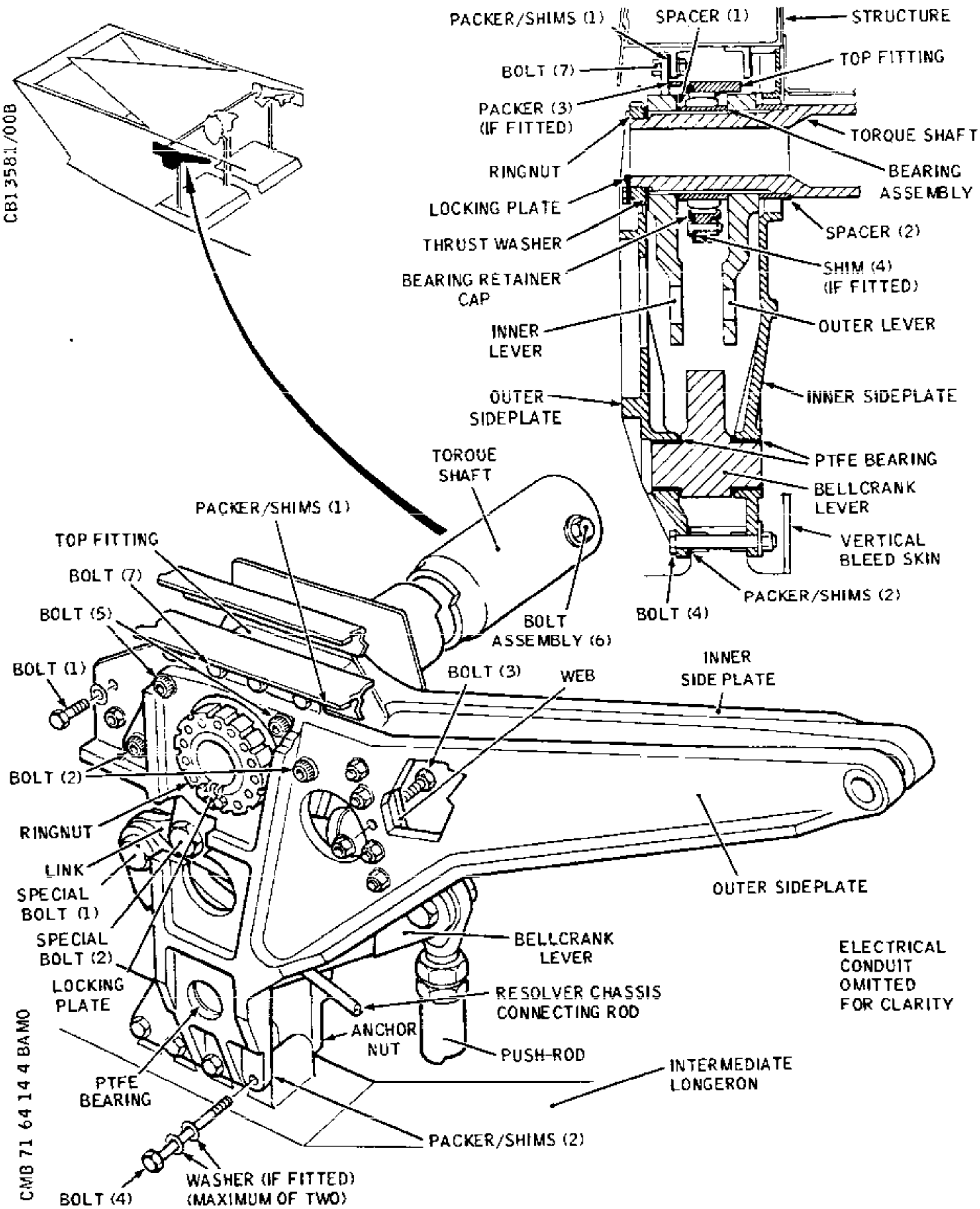
(7) Remove the outer sideplate, packer/shims (1)and (2) and, if fitted, packer (3); if applicable, identify the packer (3) with the position from which it was removed.

(8) Remove the split pins, nuts and special bolts securing the link to the bellcrank lever and the inner lever; remove the link and bellcrank lever.

(9) Remove the inner lever and spacer (1).

(10) Remove the five self-locking nuts and bolts and the five bolts securing the bearing retainer cap to the top fitting.

(11) Remove the bearing retainer cap, shim (4) (if fitted), bearing assembly, outer lever and spacer (2).



- Sidewall Actuation Mechanism - Installation
R Figure 402

(12) If required, remove the torque shaft as follows:-

(a) At the centre wall end of the torque shaft, remove the split pin, nut and bolt assembly (6).

(b) Carefully ease the torque shaft away from the centre wall mechanism, ensuring that the splines slide freely.

(c) Suitably protect the splines against damage.

D. Install Sidewall Actuation Mechanism

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

(1) Ensure that the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.

(2) If applicable, connect the torque shaft to the centre wall mechanism as follows:-

(a) Ensuring that the holes for the bolt assembly (6) are in line, carefully ease the torque shaft on to the centre wall shaft; align the holes and insert the bolt assembly (6); fit the nut.

(b) Torque-tighten the nut to between 40 and 50 lbf in (0.452 and 0.565 mdaN); fit a split pin.

CAUTION: IN OPERATION (3), ENSURE THAT THE GREASE DOES
R NOT CONTACT ANY PTFE BEARING.

(3) Lightly coat with Never-Seez grease the external splines of the torque shaft, and the spacer (2).

(4) Position on the torque shaft, the spacer (2), outer lever, top fitting, bearing assembly, shim (4) (if previously fitted) and bearing retainer cap.

(5) Assemble the top fitting, bearing assembly, shim (4) (if fitted) and bearing retainer cap, as follows:-

(a) Fit the five bolts and self-locking nuts.

(b) Fit the five bolts.

(c) Before tightening any nut or bolt carry out the following:-

c1) Lightly hold together the bearing retainer cap, shim (4) (if fitted) and top fitting.

c2) Check that the gap between the retainer cap and top fitting is between 0.000 and 0.002
R in (0.000 and 0.051 mm).

c3) If necessary, adjust the thickness of shim (4) to achieve the requirement of operation c2).

(d) Progressively torque-tighten, in a diametrical sequence, the five self-locking nuts to between 62 and 71 lbf in (0.701 and 0.802 mdaN), and the five bolts to between 55 and 66 lbf in (0.621 and 0.746 mdaN). Lock the five bolts with locking wire in accordance with 20-21-13.

(6) Position the spacer (1) and inner lever on the torque shaft.

(7) Fit the bellcrank lever to the inner sideplate, ensuring that the PTFE bearing is not damaged as the lever spigot is inserted.

(8) Place the packer/shims (1) and (2) and the packer (3) (if any) in the position identified on removal.

(9) Position the outer sideplate, ensuring that the bell-crank lever spigot enters the PTFE bearing without causing damage.

(10) Fit the following items, but do not fully tighten any bolt or nut at this stage:-

(a) Bolts (4) and, if removed, washers.

(b) Bolts (2) and washers, and bolts (5) and washers.

(c) Bolts (1) and washers.

R (d) Bolts (7) and washers.

R (e) Bolts (3), washers and nuts.

(11) Lightly coat the thrust washer and the threads of the ringnut with Never-Seez grease. Position the thrust washer and screw the ringnut on to the torque shaft. Hand-tighten the ringnut.

(12) Torque-tighten, to the values quoted, the following

bolts/nuts:-

(a) Bolts (2): 400 to 425 lbf in (4.520 to 4.802 mdaN).

(b) Bolts (5): 245 to 270 lbf in (2.768 to 3.051 mdaN).

(c) Bolts (1): 71 to 80 lbf in (0.802 to 0.904 mdaN).

(d) Bolts (4): 276 to 316 lbf in (3.119 to 3.570 mdaN).

(e) Nuts on bolts (3): 31 to 40 lbf in (0.350 to 0.452 mdaN). Do not fit split pins at this stage.

(f) Bolts (7): 124 to 142 lbf in (1.401 to 1.605 mdaN)

CAUTION: IN OPERATION (13), DO NOT UNSCREW THE RINGNUT IN AN ATTEMPT TO FIT THE LOCKING PLATE.

R (13) Using the torque adapter, torque-tighten the ringnut to between 2,800 and 3,000 lbf in (32.640 and 33.900 mdaN), checking throughout the torque range that the locking plate can be fitted, but do not fit the locking plate at this stage.

NOTE: The locking plate may be turned over to give additional locking positions.

An alternative locking plate is available if the existing plate cannot satisfy the locking requirements.

(14) Check that the following requirements are met:-

(a) Total side-float between the bellcrank lever and PTFE bearings: 0.005 to 0.007 in (0.127 to 0.178 mm). If this requirement is not met, carry out operation (15).

(b) Clearance between the tails of the four bolts (4) and the vertical bleed skin: 0.025 in (0.635 mm) minimum. If this requirement is not met, carry out operation (16).

(15) If the requirement of operation (14)(a) is not met, rectify as follows:-

(a) Carry out operations C.(3) to (6) and remove the outer sideplate.

(b) Adjust, equally, the thickness of packer/shims (1) and (2).

(c) If the thickness of packer/shims (1) and (2) is increased, the packer (3) (if fitted) must be exchanged for one packer which is thicker by the amount (-0.001 -0.002 in) (-0.0254 -0.0508 mm) of the increase of packer/shims (1) and (2). If the packer (3) is not already fitted, one packer equivalent to the increase (-0.001 -0.002 in) (-0.0254 -0.0508 mm) must be introduced.

(d) If the thickness of packer/shims (1) and (2) is decreased, the packer (3) (if fitted) must be exchanged for one packer which is thinner by the amount (-0.001 -0.002 in) (-0.0254 -0.0508 mm) of the decrease of packer/shims (1) and (2). If the packer (3) is not already fitted, machine the appropriate face of the top fitting by the amount (-0.001 -0.002 in) (-0.0254 -0.0508 mm) of the decrease of packer/shims (1) and (2).

(e) Reassemble the outer sideplate as detailed in operations (9) to (13), and (14)(a), to check the side-float.

(16) If the requirement of operation (14)(b) is not met, rectify as follows:-

(a) Ascertain which bolts (4) do not have the required minimum clearance from the vertical bleed skin.

(b) Remove the appropriate bolts (4).

(c) Add washers, up to the permissible maximum of two, under the head of each bolt having insufficient clearance. If the clearance is still insufficient, grind the tail of the bolt the minimum amount, taking into account that the bolt tail must protrude through the anchor nut.

(d) Fit and torque-tighten the bolts (4) to between
R 276 and 316 lbf in (3.119 and 3.570 mdaN).

(17) Position the locking plate to lock the ringnut and fit the two bolts. Torque-tighten the bolts to between 55 and 66 lbf in (0.621 and 0.746 mdaN); lock each bolt separately, to the holes in the locking plate, with locking wire in accordance with 20-21-13.

R CAUTION: IN OPERATION (18), THE BOLT HEADS MUST
R BE WIRE-LOCKED SEPARATELY.

R (18) Wire-lock, in accordance with 20-21-13, bolts
R (2), (4) and (5).

R (19) Encapsulate with sealant, in accordance with
R 20-22-19, the following:-

R (a) Heads of bolts (3) and nuts.

R (b) Heads of bolts (7) and nuts.

R (c) Heads of bolts (1).

R (20) Position the link between the fork of the bellcrank lever and the inner and outer levers; insert the special bolts (1) and (2) and fit the nuts.

CAUTION: IN OPERATION (21), DO NOT UNSCREW EITHER NUT IN AN ATTEMPT TO FIT A SPLIT PIN.

R (21) Torque-tighten each nut on the special bolts (1) and (2) to between 600 and 1,200 lbf in (6.780 and 13.560 mdaN), checking throughout the torque range that the split pin can be inserted. Fit the split pins.

R (22) Attach the flexible electrical conduits to the mechanism.

E. Conclusion

(1) Install the sidewall push-rod as detailed in paragraph 2.D.

(2) Rig the spill door and pre-load the push-rods as detailed in 71-64-12, Adjustment/Test.

(3) Install the actuator as detailed in 71-64-11, Removal/Installation.

(4) Connect the connecting-rod to the bellcrank lever and resolver chassis as detailed in 71-64-13, Removal/Installation.

(5) Check, and adjust if necessary, the setting of the vane position indicator microswitches as detailed in 71-64-15, Adjustment/Test.

(6) Check, and adjust if necessary, the spill door position indicator resolver setting as detailed in 71-64-16, Adjustment/Test.

(7) Check, and adjust if necessary, the resolver chassis setting as detailed in 71-64-13, Adjustment/Test.

(8) Carry out a spill door Functional Test as detailed in 71-64-12, Adjustment/Test.

5. Centre Wall Actuation Mechanism (Ref. Fig. 403)

A. Equipment and Materials

DESCRIPTION	PART NO.
Support, for spill door when fully open	-
Torque spanner, 100 to 110 lbf in 1.130 to 1.243 mdaN)	-
Torque spanner, 124 to 142 lbf in (1.401 to 1.605 mdaN)	-
Torque spanner, 125 to 140 lbf in (1.412 to 1.582 mdaN)	-
Torque spanner, 142 to 160 lbf in (1.605 to 1.808 mdaN)	-
Torque spanner, 240 to 265 lbf in (2.712 to 2.994 mdaN)	-
Torque spanner, 300 to 650 lbf in (3.390 to 7.345 mdaN)	-
Torque spanner, 420 to 440 lbf in (4.746 to 4.972 mdaN)	-
Torque spanner, 700 to 730 lbf in (7.910 to 8.249 mdaN)	-
R Locking wire	-

DESCRIPTION	PART NO.
Never-Seez grease	CM145

B. Prepare

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

(1) Carry out operations 2.B.(1) to (13).

R (2) Remove the appropriate access panel (411 HZ, 421 HZ,
R 431 HZ or 441 HZ) from inside the intake, releasing
R the fasteners in the order shown on the illustration
R (Ref. Fig. 404).

(3) Remove the split pins, nuts and bolts securing the push-rods to the bellcrank levers.

(4) Manually, fully open the door and rest it on a support.

(5) Remove the appropriate actuator (Ref. 71-64-11) and the associated sidewall actuation mechanism and torque shaft as detailed in paragraph 4.

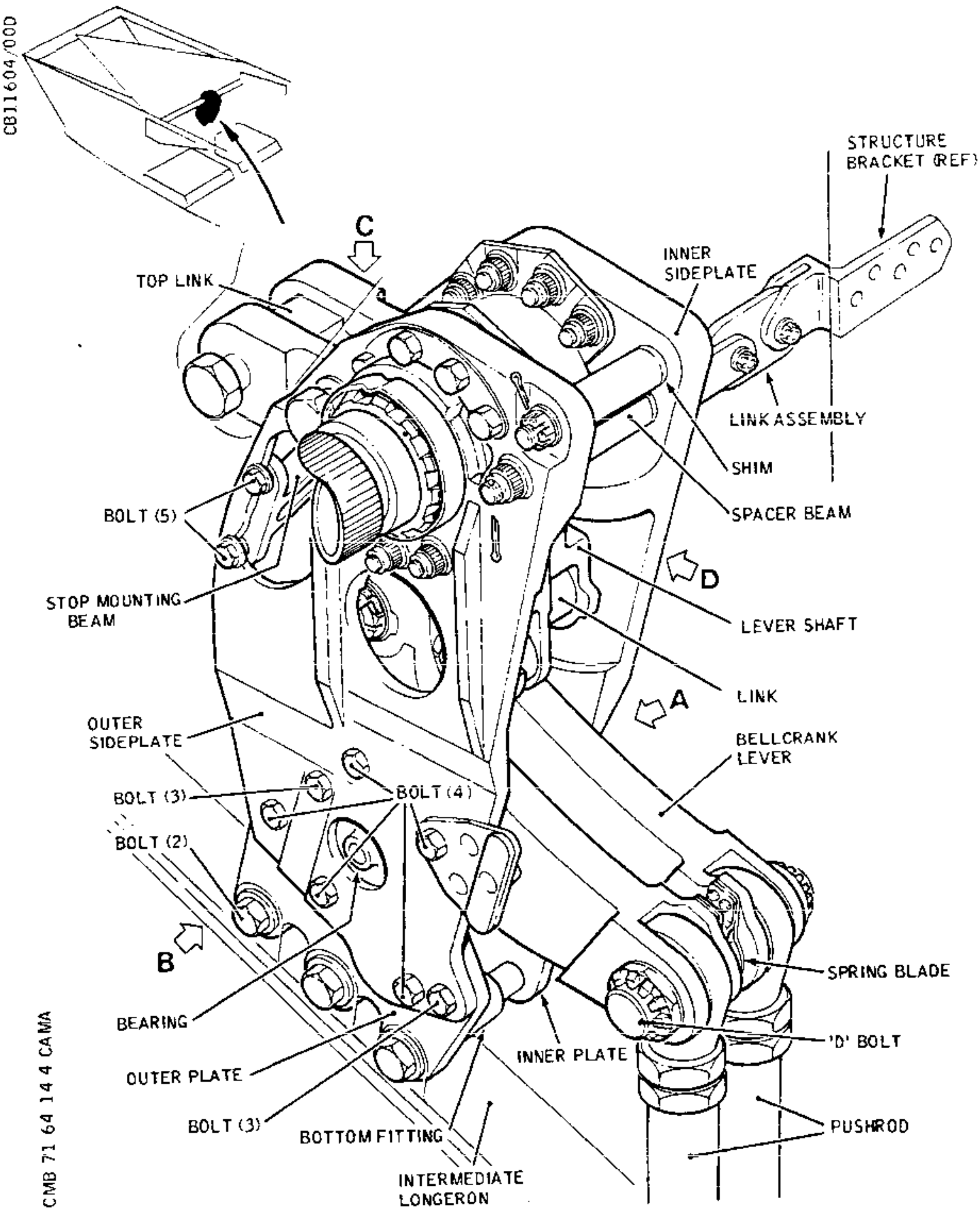
C. Remove Centre Wall Actuation Mechanism

NOTE: The following instructions are written for the removal of one centre wall mechanism. If it is required that both mechanisms be removed, it will be obvious that certain bolts which are left in place, and other parts, will have to be removed.

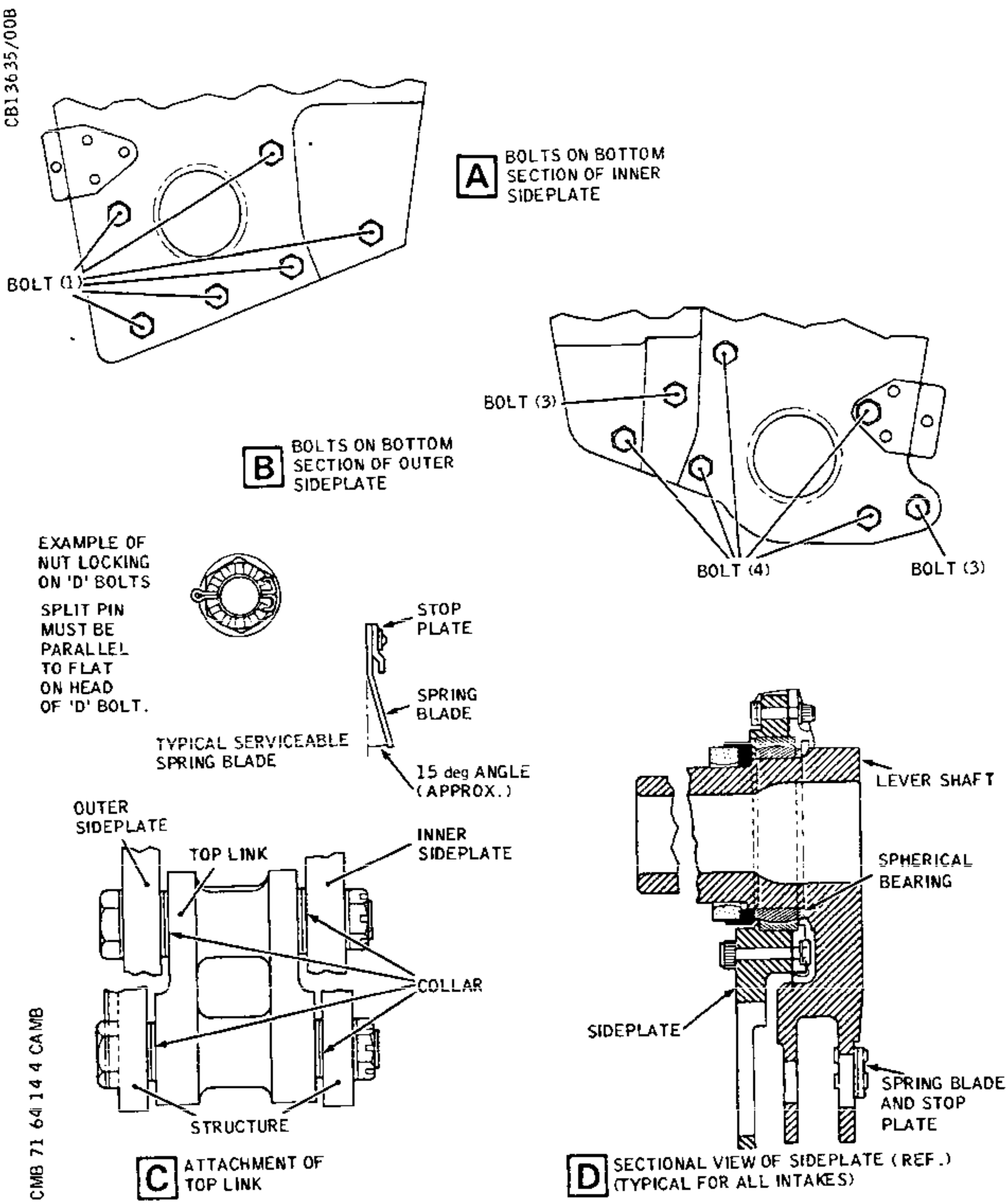
To remove the bottom fitting, it is necessary to remove both mechanisms.

(1) Remove the split pins and nuts from the 'D' bolts securing the link to the bellcrank lever and lever shaft. Press and hold each spring blade flat against the face of the associated lever; remove the 'D' bolts and link.

(2) Remove the split pin, washer and nut from the bolt securing the top link to the sideplates. If the inner sideplate is being removed, leave the bolt in place; if the outer sideplate is being removed,



Centre Wall Actuation Mechanism - Installation (Sheet 1 of 2)
Figure 403



- Centre Wall Actuation Mechanism -
Installation (Sheet 2 of 2)
Figure 403

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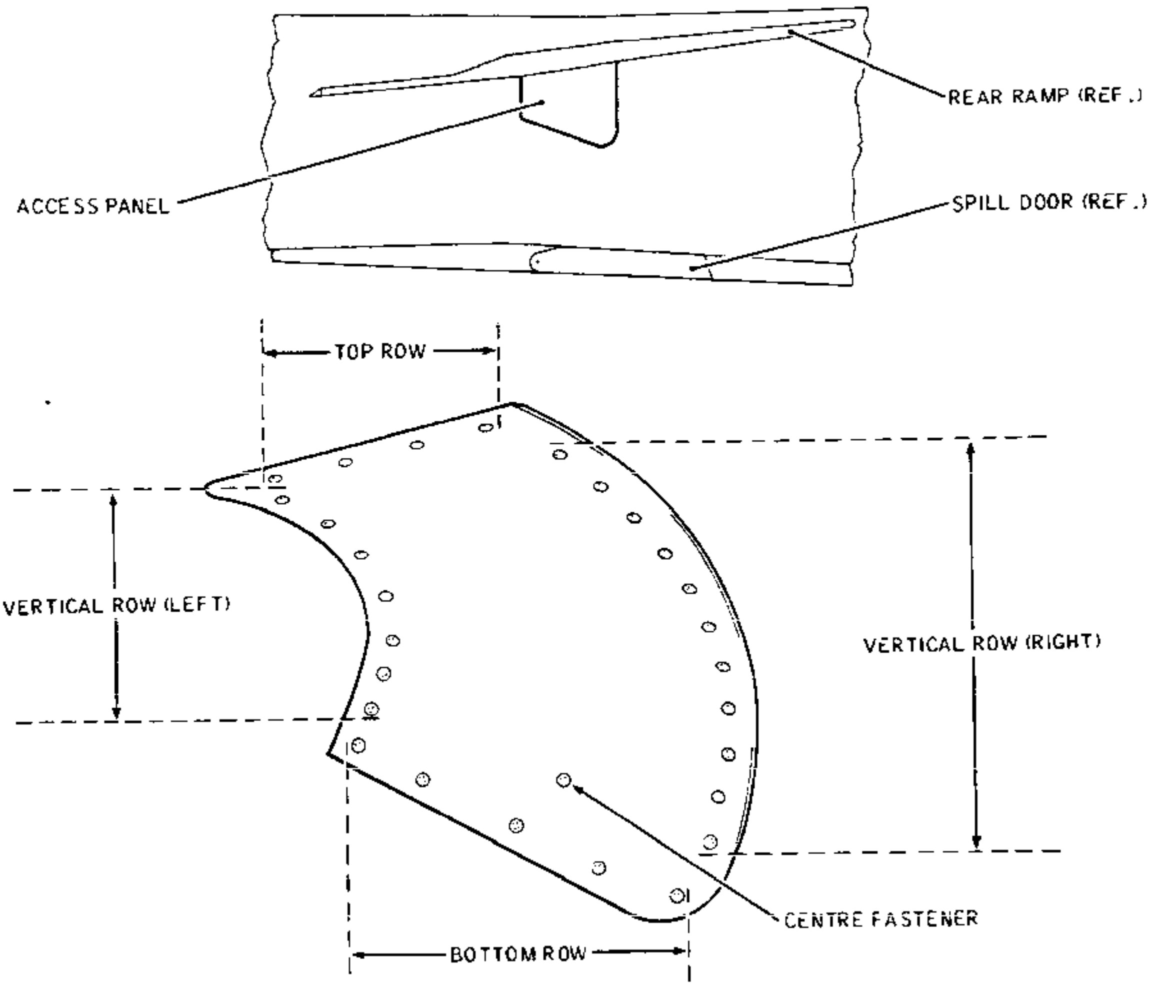


TO REMOVE ACCESS PANEL

NOTE: EACH FASTENER MUST BE FULLY UNSCREWED.

UNSCREW FASTENERS IN THE FOLLOWING ORDER:-

1. CENTRE FASTENER.
2. VERTICAL ROWS (LEFT AND RIGHT), STARTING IN CENTRE AND WORKING, ALTERNATELY, EACH SIDE OF CENTRE.
3. TOP ROW.
4. BOTTOM ROW.

TO FIT PANEL

INSERT FASTENERS IN REVERSE ORDER OF REMOVAL (i.e., PARAS., 4, 3, 2, AND 1.

CMB 71 64 14 4 CF MO

R - Intake Internal Panel - Installation
Figure 404

remove the bolt and collars. Identify each collar with the position from which it was removed.

(3) Remove the split pins, slotted nut and self-locking nut from the bolts securing the spacer beam to the sideplates. If the outer sideplate is being removed, leave the bolts and spacer beam in place; if the inner sideplate is being removed, disconnect the link assembly and remove the bolts, spacer beam and shim. Identify the shim with the position from which it was removed.

(4) Remove the appropriate nuts and bolts (5) securing the sideplate being removed to the stop mounting beam.

(5) Depending upon which sideplate is being removed, refer to Detail A or B (Ref. Fig. 403) and remove the bolts (1) securing the inner sideplate or bolts (3) and (4) securing the outer sideplate.

(6) Remove the appropriate sideplate complete with the lever shaft and associated parts.

(7) Remove the split pins, washers and nuts from the bolts (2) securing the inner and outer plates to the bottom fitting. If the inner plate is being removed, leave the bolts (2) in place; if the outer plate is being removed, remove the bolts (2).

(8) Remove the appropriate plate and its associated bell-crank lever.

D. Prepare to Install Centre Wall Actuation Mechanism

(1) Check that the spring blades from which the 'D' bolts have been removed are serviceable, as follows:-

(a) Check that the profile of the spring blade is at an angle of 15 deg (approximately) to the side of its associated part (Ref. Fig. 403).

(b) Press and hold the spring blade flat against its associated part and fully insert the 'D' bolt, ensuring that the bolt head is correctly placed.

(c) Press lightly on the tail of the 'D' bolt until the bolt just moves; check that the spring blade restricts the bolt movement to not more than 0.10 in (2.54 mm). If movement exceeds 0.10 (2.54 mm), the spring blade is

unserviceable; therefore a serviceable part (including spring blade) must be obtained.

E. Install Centre Wall Actuation Mechanism (Ref. Fig. 405)

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

NOTE: The following instructions are written on the assumption that one mechanism is to be installed; if both mechanisms are to be installed the procedures apply equally, with the differences stated.

(1) Ensure that the safety precautions taken in operations 2.B.(2) to (7) have not been cancelled.

(2) Insert the bellcrank lever spigot in the bottom fitting, ensuring that the bearing is not damaged.

(3) If the outer plate only was removed, position the outer plate, sliding the bearing over the other bellcrank lever spigot; insert the bolts (2) through the bottom fitting and inner plate.

(4) If the inner plate only was removed, place the inner plate over the bolts (2), sliding the bearing over the other bellcrank lever spigot.

(5) Fit the washers and nuts to the bolts (2). Torque-tighten the nuts to between 100 and 110 lbf in (1.130 and 1.243 mdaN). Fit split pins.

CLEARANCE LOCATION	CLEARANCE REF.	CLEARANCE REQUIRED
Between sideplates and tails of lever shaft/ link bolts	'M'	Min. 0.070 in (1.778 mm)
Between sideplates and tails of bellcrank lever/link bolts	'N'	Min. 0.100 in (2.540 mm)

	CLEARANCE LOCATION	CLEARANCE REF.	CLEARANCE REQUIRED
R R R R R	Between bellcrank lever and tails of bolts securing appropriate sideplate to inner/ outer sideplate assembly	'O'	Min. 0.050 in (1.270 mm)
	Between faces of collars and bushes	'P'	Min. 0.002 in (0.0508 mm) Max. 0.010 in (0.254 mm)
R R	Between opposing heads of link bolts	'Q'	Min. 0.190 in (4.826 mm)
	Between bleed floor datum and ringnut cup washer	'U'	Min. 0.050 in (1.270 mm)

Centre Wall Actuation Mechanism Clearances
Table 402

(6) If the outer sideplate only was removed, proceed as follows:-

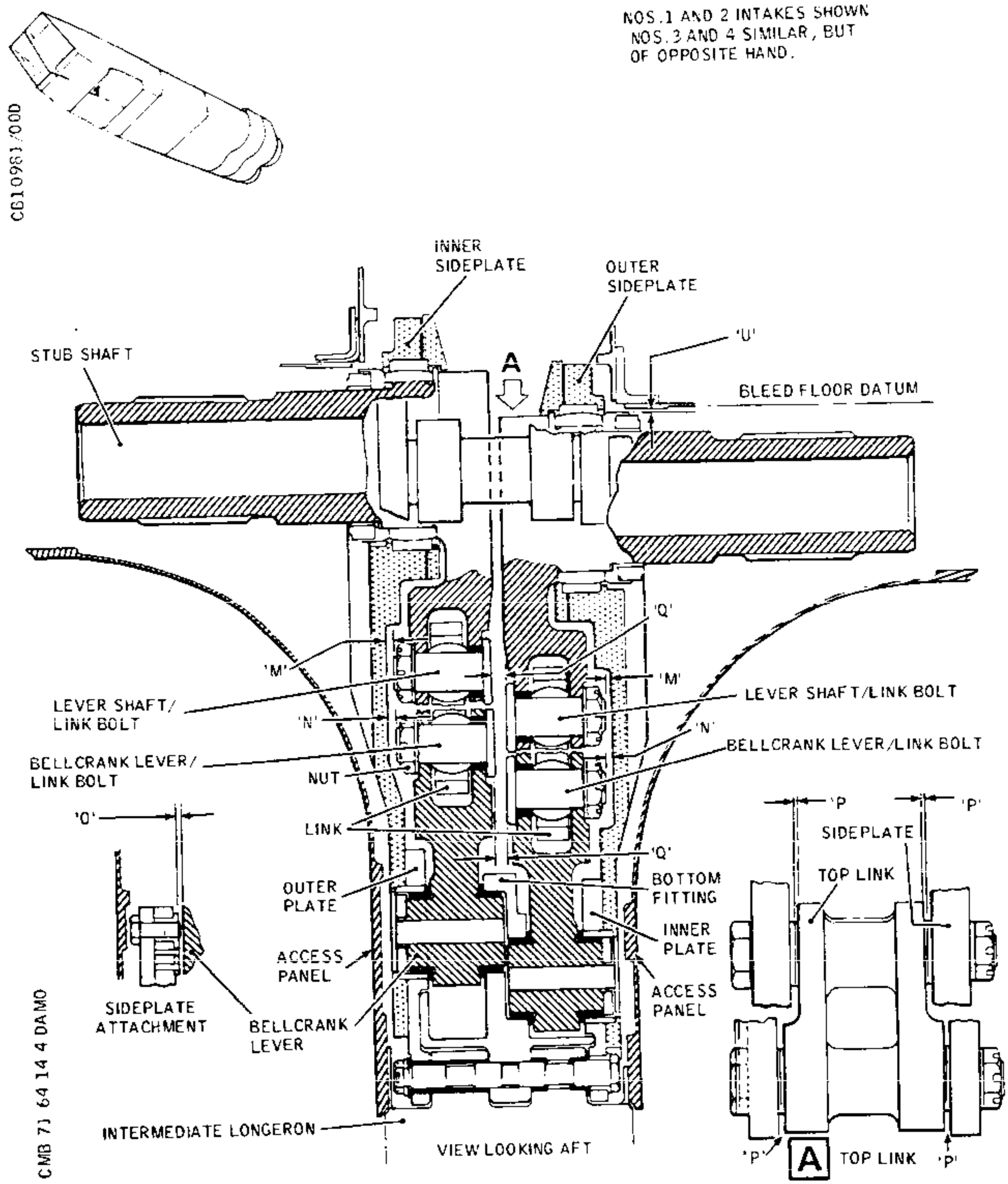
(a) Ensure that the spacer beam and the shim (as identified on removal) are in position, and then place the outer sideplate over the spacer beam bolts; fit the slotted nut and self-locking nut to their respective bolts. Do not fully tighten the nuts at this stage.

(b) Fit the bolts (3) and (4) (Detail B) (Ref. Fig. 403), but do not fully tighten them at this stage.

(c) Position the top link between the sideplates; position the collars (Detail C) (Ref. Fig. 403), in the positions identified on removal, align the holes and insert the bolt. Fit the washer and nut. Do not fully tighten the nut at this stage.

R (d) Fit the appropriate bolts (5) and nuts to secure the stop mounting beam and sideplate.

(e) Torque-tighten, to the values quoted, the following nuts and bolts:-



- Centre Wall Actuation Mechanism - Clearances
Figure 405

R

e1) Bolts (3): 142 to 160 lbf in (1.605 to 1.808 mdaN).

R e2) Bolts (4): 142 to 160 lbf in (1.605 to
R 1.808 mdaN).

R e3) Nuts on bolts (5): 124 to 142 lbf in (1.401 to 1.605 mdaN).

e4) Slotted nut on spacer beam bolt: 240 to 265 lbf in (2.712 to 2.994 mdaN) Fit a split pin.

e5) Self-locking nut on spacer beam bolt: 700 to 730 lbf in (7.910 to 8.249 mdaN). Ensure that the forks on the bolt and structure remain absolutely in line. Fit a split pin through the tail of the bolt.

e6) Nut on top link bolt: 420 to 440 lbf in (4.746 to 4.972 mdaN). Fit a split pin.

R e7) Encapsulate the nuts on the bolts (5)
R with sealant in accordance with
R 20-22-19.

(7) If the inner sideplate only was removed, proceed as follows:-

(a) Place the collar (as identified on removal) on the top link bolt; position the inner sideplate over the top link bolt and fit the washer and nut. Do not fully tighten the nut at this stage.

(b) Fit the bolts (1) (Detail B) (Ref. Fig. 403), but do not fully tighten them at this stage.

(c) Position the spacer beam and shim (as identified on removal) and insert the two bolts through the inner sideplate, spacer beam, shim and outer sideplate; fit the slotted nut and self-locking nut, but do not fully tighten the nuts at this stage.

R (d) Fit the appropriate bolts (5) and nuts to secure the stop mounting beam and sideplate.

(e) Position the link assembly in the forks of the bolts and structure bracket. Fit the bolts, washers and nuts. Torque-tighten the nuts to

R between 125 and 140 lbf in (1.412 and 1.582 mdaN) and fit split pins.

(f) Torque-tighten, to the values quoted, the following nuts and bolts:-

R f1) Bolts (1): 142 to 160 lbf in (1.605 to
R 1.808 mdaN).

R f2) Nuts on bolts (5): 124 to 142 lbf in
R (1.401 to 1.605 mdaN).

f3) Slotted nut on spacer beam bolt: 240 to
R 265 lbf in (2.712 to 2.994 mdaN). Fit a split pin.

f4) Self-locking nut on spacer beam bolt: 700 to 730 lbf in (7.910 to 8.249 mdaN). Ensure that the forks of the bolt and structure remain absolutely in line. Fit a split pin through the tail of the bolt.

f5) Nut on top link bolt: 420 to 440 lbf in (4.746 to 4.972 mdaN). Fit a split pin.

R f6) Encapsulate the nuts on the bolts (5)
R with sealant in accordance with 20-22-19.

R (8) Position the link between the forks of the lever shaft and bellcrank lever.

CAUTION: IN OPERATION (9), ENSURE THAT THE GREASE DOES NOT CONTACT THE PTFE LINING OF THE SPHERICAL BEARINGS.

(9) Lightly coat the 'D' bolts with Never-Seez grease; press and hold flat each spring blade and fully insert the 'D' bolts, ensuring that their heads are correctly placed. Fit the nuts.

CAUTION: IN OPERATION (10), THE NUTS MUST NOT BE UNSCREWED IN AN ATTEMPT TO FIT THE SPLIT PINS.

R THE SPLIT PIN HOLES MUST BE ALIGNED
R HORIZONTALLY.

(10) Torque-tighten each nut to 300 lbf in (3.390 mdaN) (minimum value). If the split pin cannot be inserted (i.e., holes not aligned), progressively increase the
R torque to 650 lbf in (7.345 mdaN) (maximum value),

R checking throughout if the split pin can be inserted
R horizontally.

CAUTION: IN OPERATION (11), THE LEGS OF THE SPLIT PINS MUST NOT BE BENT OVER THE END OF THE BOLTS.

R (11) Fit a split pin (horizontally) to the nut of each 'D' bolt. Turn the legs of each split pin in opposite directions around the nut; crop the legs
R and push the end of each leg into a castellation
R to prevent the split pin from turning (Ref. Fig. 403).

(12) Using Table 402 in conjunction with the illustration (Ref. Fig. 405), manually move the mechanism and check that the clearances are as quoted.

F. Conclusion

(1) Install the sidewall actuation mechanism and actuator as detailed in paragraph 4.D.

(2) Install the push-rods as detailed in paragraphs 2.D. and 3.E.

(3) Rig the spill door and pre-load the push-rods as detailed in 71-64-12, Adjustment/Test.

(4) Install the actuator as detailed in 71-64-11, Removal/Installation.

R (5) Check, and adjust if necessary, the setting of
R the vane position indicator microswitches as
R detailed in 71-64-15, Adjustment/Test.

R (6) Check, and adjust if necessary, the spill door
R position indicator resolver setting as detailed
R in 71-64-16, Adjustment/Test.

R (7) Check, and adjust if necessary, the resolver
R chassis setting as detailed in 71-64-13,
R Adjustment/Test.

R (8) Carry out a spill door Functional Test as detailed in 71-64-12, Adjustment/Test.

VANE POSITION INDICATOR MICROSWITCH AND OPERATING MECHANISM - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

R

1. General

Two vane position indicator microswitches (vane open, vane closed) are attached to the structure at the forward (hinge) end of each spill door.

Access to the microswitches and operating mechanism is gained after removal of a panel located below, and in the centre of, the spill door hinge line.

2. Vane Position Indicator Microswitch and Operating Mechanism (Ref. Fig.401 and 402)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Protective cover, for intake lip	D926806000
Anti-interference plate, for intake management panel	E925068000
Servicing extension (springboard)	-

DESCRIPTION	PART NO.
Crawling board	-
Work stand	-
Cover, for engine transition ring	D935036001
Support, for spill door when fully closed	-
Support, for vane when fully open	E925051000
Torque spanner, 12 to 15 lbf in (0.136 to 0.169 mdaN)	-
Torque spanner, 40 to 45 lbf in (0.452 to 0.508 mdaN)	-
Aeroshell grease No.16	-
Never-Seez grease	CM145
Locking wire	-

B. Prepare

(1) Ensure that the four intakes are clear of personnel and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's (3CM) station to indicate that work is being carried out inside the engine intakes.

(4) On the intake management panel, proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins to the spill door hydraulic selector valves of the four intakes (Ref. 71-62-00, Servicing).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
INT 1 IND SUP	5-213	1E531	C6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
INT 2 IND SUP	5-213	2E531	C7
Engine 3			
ENG 2 & 3 AIR START	15-216	K182	D11

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
CONT			
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
INT 3 IND SUP	1-213	3E531	G9
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6
INT 4 IND SUP	1-213	4E531	F9

(8) The spill door must be fully closed, so, if applicable, proceed as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Remove the locking pin from the hydraulic selector valve associated with the appropriate spill door and hydraulic system to be used.

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(b) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(c) Make available electrical ground power as detailed in 24-41-00.

(d) Pressurize the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(e) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "SHUT" until the spill door is fully closed. Release the switch.

(f) Depressurize the hydraulic system.

(g) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(h) Trip the circuit breaker reset in operation (b) and fit a safety clip.

(i) Refit, and lock, the anti-interference plate to the intake management panel.

(j) Refit the locking pin removed in operation (a).

(9) Position the support beneath the spill door.

(10) Fit, and secure, the protective cover to the intake lip.

(11) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(12) Place the crawling board on the floor of the intake, aft of the servicing extension.

(13) Fit the cover to the engine transition ring.

(14) Remove the appropriate access panel (411 JB, 421 JB, 431 JB or 441 JB) from the spill door hinge line.

(15) Release and open the appropriate hinged panel (411, 421, 431 or 441 QZ) along the bottom forward end of the vane.

C. Remove

(1) Raise the vane and retain it in the fully open position, on a support.

(2) Remove the split pins, nuts, washers, countersunk washers and bolts (1) securing the striker plates to the brackets on the vane.

(3) Remove the striker plates and packers. Retain each plate and the associated packer together and identify them with the position from which they were removed.

(4) Remove the locknut (1) and lockwasher from the microswitch.

(5) Moving the vane as required to achieve the best working position and at all times firmly supporting the vane, remove the three bolts (2) and countersunk washers securing the fork-end fitting to the structure.

(6) Disengage and remove the fork-end fitting, ensuring that the plunger and spring remain in the bracket.

(7) Disconnect the electrical cables from the terminal block located on the bottom outer longeron, near the spill door.

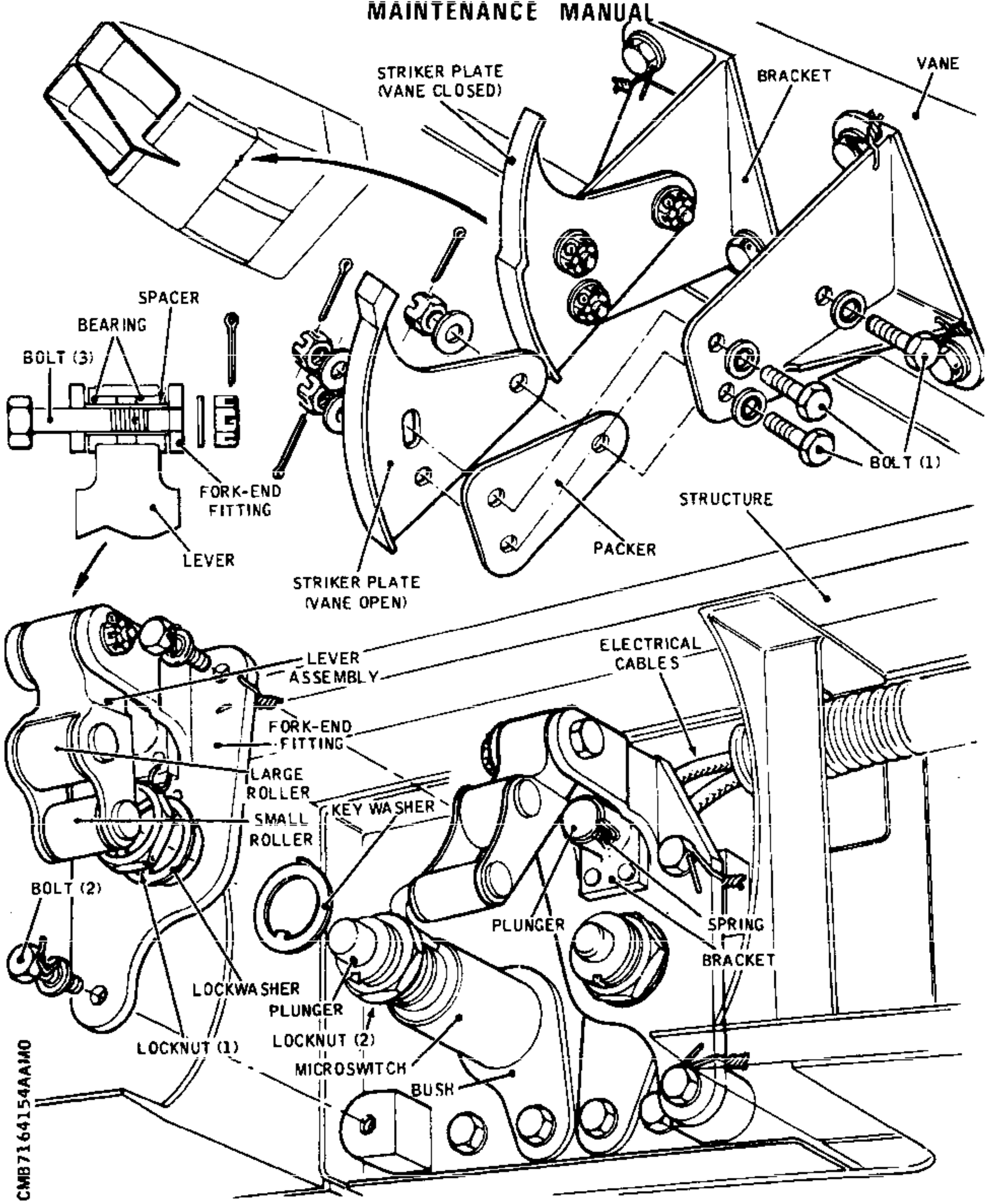
(8) Withdraw the electrical cables back to the microswitch.

(9) Remove the microswitch from the bush fitted to the structure.

(10) Fit the lockwasher and locknut (1) to the microswitch.

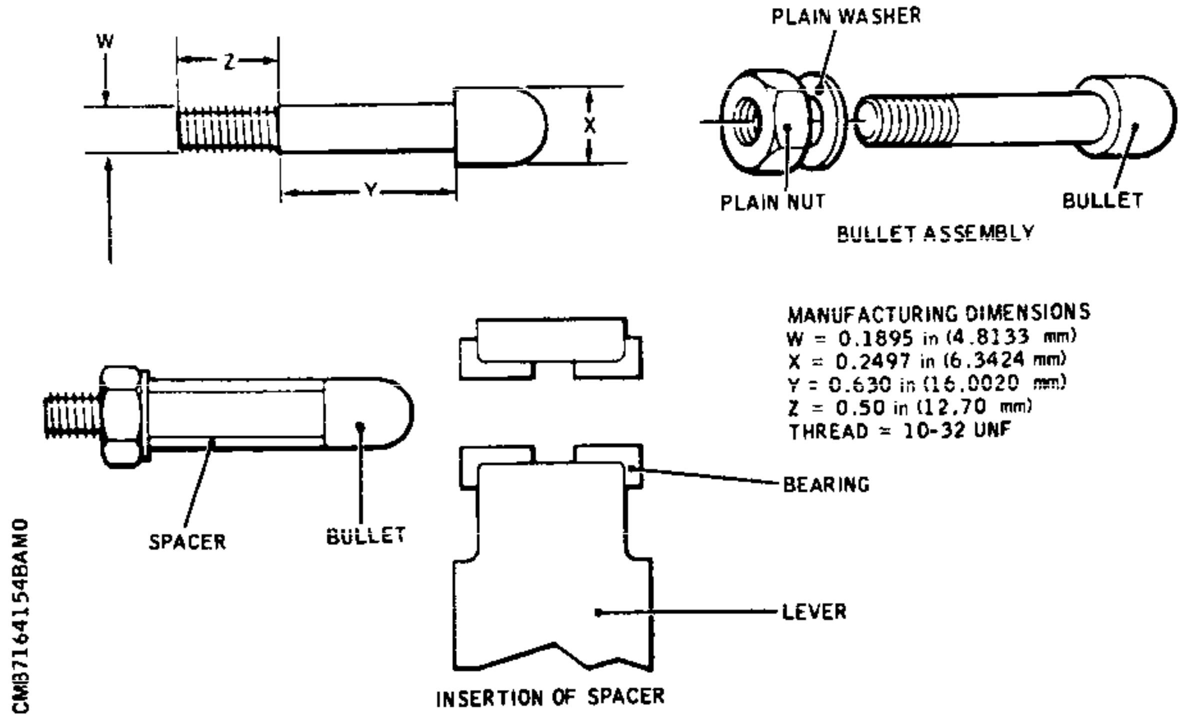
(11) If required, remove the lever assembly from the fork-end fitting as follows:-

(a) Remove the split pin, nut, countersunk washer and bolt (3) securing the lever assembly to the fork-end fitting.



- Vane Position Indicator Microswitch and Operating Mechanism - Installation
Figure 401

(b) Remove the lever assembly.



Bullet - Assembly and Application
Figure 402

D. Prepare to Install

(1) If applicable, connect the lever assembly to the fork-end fitting, as follows:-

NOTE: Operation (a) applies only if a new lever assembly (supplied less spacer) is being fitted or if the PTFE bearings are being renewed.

(a) Using any suitable means to ensure that the PTFE bearings are not damaged (e.g., a round-nosed bullet locally manufactured to the dimensions quoted, (Ref. Fig. 402)), insert the spacer into the lever

(b) Position the lever assembly in the fork-end fitting and fit the bolt (3), countersunk washer

and nut.

(c) Torque-tighten the nut to between 12 and 15 lbf in (0.136 and 0.169 mdaN) and fit a split pin.

(d) Check that the lever assembly swings freely on the spacer.

(2) Remove the spring and plunger and lightly coat them with Never-Seez grease.

(3) Lift the lever assembly and insert the spring and plunger into the bracket on the fork-end fitting. Lower the lever assembly onto the plunger.

(4) Remove the locknut (1), lockwasher and key washer from the microswitch. Set the locknut (2) in the centre (approximately) of the microswitch threads.

E. Install

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 401.

(1) Ensure that the safety precautions taken in operations B.(2) to (7) have not been cancelled.

(2) Position the microswitch in the bush fitted to the structure, with the electrical cables lying toward the outer bottom longeron of the intake.

(3) Route the electrical cables to the appropriate terminal block. Do not connect the electrical cables at this stage.

(4) Ensuring that the spring and plunger remain in the bracket, position the fork-end fitting on the microswitch; fit the key washer, lockwasher and locknut (1) on the microswitch. Tighten the locknut (1) sufficiently to secure the microswitch.

(5) Hold the fork-end fitting against the structure, ensuring that the electrical cables are not trapped; fit the three bolts, lightly coated with Aeroshell No.16 grease, and countersunk washers.

(6) Torque-tighten the bolts to between 40 and 45 lbf in (0.452 and 0.508 mdaN). Lock each bolt to the fork-end fitting with locking wire in accordance with 20-21-13.

(7) Raise the vane and retain it in the fully open

position, on a support.

(8) Ensure that each microswitch plunger is well clear of its associated small roller before positioning the packers and striker plates on the brackets in the positions identified on removal; fit the bolts (1), lightly coated with Aeroshell No.16 grease, the countersunk washers, washers and nuts. Check that there is a clearance of not less than 0.10 in (2.54 mm) between each microswitch plunger and its associated small roller.

(9) Torque-tighten the nuts to between 12 and 15 lbf in (0.136 and 0.169 mdaN). Do not fit split pins at this stage.

(10) Check that the large roller of each lever assembly and the mating face (track) of the associated striker plate are symmetrical, in a lateral sense, to within 0.020 in (0.508 mm).

(11) If the requirements of operation (10) are met, fit split pins and ignore operation (12).

(12) If the requirements of operation (10) are not met, on either assembly, proceed as follows:-

(a) Ascertain in which direction, and by what amount, the striker plate needs to be moved.

NOTE: If the striker plate requires to be moved away from the bracket (i.e., existing packer too thin), a new packer must be obtained.

(b) Remove the striker plate and packer from the bracket (Ref. paras.C.(2) and (3)).

(c) Machine the packer to the thickness determined in operation (a).

(d) If a new packer is being fitted, use the old packer as a template and drill, accurately, the holes in the new packer.

(e) Treat the machined surface of the packer in accordance with 20-24-14.

(f) Fit the packer and striker plate to the bracket and torque-tighten the nuts (Ref. paras.(8) and (9)). Fit split pins.

F. Conclusion

(1) Connect the electrical cables of the vane 'closed' microswitch to the appropriate terminal block, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(2) Torque-tighten the terminal nuts to between 12 and 14 lbf in (0.136 and 0.158 mdaN) in accordance with 20-27-14.

(3) Adjust both microswitches, torque-tighten the microswitch locknuts and connect the electrical cables of the vane 'open' microswitch as detailed in Adjustment/Test.

(4) Carry out a Functional Test as detailed in Adjustment/Test.

VANE POSITION INDICATOR MICROSWITCH AND OPERATING MECHANISM - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

Two vane position indicator microswitches and operating mechanisms (vane open, vane closed) are located at the forward (hinge) end of each spill door. Access to the microswitches and mechanism is gained after removal of a panel located below, and in the centre of, the spill door hinge line.

Adjustment of one microswitch must be accompanied by a check and, if necessary, adjustment of its associated microswitch.

This topic contains the adjustment procedures, and a Functional Test to prove the integrity of the vane position indication electrical system after the microswitches have been adjusted.

The Functional Test may be used at any time to prove the integrity of the electrical system, but the test will not establish that the microswitches are operating within the required limits. To check for correct operation, the adjustment procedures must be used.

2. Adjustment (Ref. Fig. 501)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Protective cover, for intake lip	D926806000
Anti-interference plate, for intake management panel	E925068000
Servicing extension (springboard)	-
Crawling board	-
Work stand	-
Cover, for engine transition ring	D935036001
Support, for spill door when fully closed	-
R Support, for vane	E925051000
Torque spanner, 12 to 14 lbf in (0.136 to 0.158 mdaN)	Ultra-WB808-6UNC
Torque spanner, 75 to 85 lbf in (0.847 to 0.960 mdaN)	-
R Angle indicator (or suitable alternative), for measuring vane angles	D920327000
Locking wire	-

B. Prepare to Adjust Microswitches

(1) Ensure that the four intakes are clear of personnel and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons

from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's (3CM) station to indicate that work is being carried out inside the engine intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the hydraulic system which will be used (i.e., green, blue or yellow).

(c) Fit and lock, the anti-interference plate.

(5) Fit locking pins to the spill door hydraulic selector valves of all intakes (Ref. 71-62-00, Servicing).

(6) Trip the following circuit breakers and fit safety clips.

	SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
	Engine 1			
R	INT 1 MAIN HYD SUP	1-213	1K1950	D9
	INT 1 ST'BY HYD SUP	15-216	1K1960	B8
	AICU 1A SUP	2-213	1K2050	D14
	AICU 1B SUP	14-216	1K2051	A5
	Engine 2			
	INT 2 MAIN HYD SUP	15-215	2K1950	B18
	INT 2 ST'BY HYD SUP	1-213	2K1960	E9
R	AICU 2A SUP	13-216	2K2050	A3
R	AICU 2B SUP	2-213	2K2051	H14
	Engine 3			
	INT 3 MAIN HYD SUP	5-213	3K1950	A7

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SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
R Engines 1, 2, 3 and 4			
R HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
R HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
INT 1 IND SUP	5-213	1E531	C6
R Engine 2			

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
INT 2 IND SUP	5-213	2E531	C7
R Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
INT 3 IND SUP	1-213	3E531	G9
R Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6
INT 4 IND SUP	1-213	4E531	F9

R

(8) The spill door must be fully closed, so, if applicable, proceed as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS AND EQUIPMENT, AND THAT BARRIERS

ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED
R EXCEPT THE LOCKING PIN REMOVED AND THE
R CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Remove the locking pin from the hydraulic selector valve associated with the appropriate spill door and hydraulic system to be used.

R (b) According to which hydraulic system is to be
R used and which spill door is being operated,
R remove the safety clip and reset the
R appropriate one of the following circuit
R breakers (Ref. para.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3, or 4) ST'BY HYD SUP.

(c) Make available electrical ground power as detailed in 24-41-00.

R (d) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(e) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "SHUT" until the spill door is fully closed. Release the switch.

(f) Depressurize the hydraulic system.

(g) Switch off and disconnect electrical ground power as detailed in 24-41-00.

R (h) Trip the circuit breaker reset in operation
R (b) and fit a safety clip.

(i) Refit, and lock, the anti-interference plate to the intake management panel.

(j) Refit the locking pin removed in operation (a).

(9) Position the support beneath the spill door.

(10) Fit, and secure, the protective cover to the intake lip.

(11) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(12) Place the crawling board on the floor of the intake, aft of the servicing extension.

(13) Fit the cover to the engine transition ring.

(14) Remove the appropriate access panel (411 JB, 421 JB, 431 JB or 441 JB) from the spill door hinge line.

(15) Position one end of an angle indicator in the centre of the vane on the fore-and-aft centre line, and the other end on a suitable fixed structure. Identify the position of the indicator on the vane and structure with marks of a temporary nature (e.g., with pencil), for use if the indicator is inadvertently moved out of position.

(16) Press down on the vane to ensure that it is fully closed; record the angle shown on the angle indicator.

C. Adjust Microswitches

R

NOTE: The appropriate spill door must remain fully closed during operation (1), and during operation (2) until specified otherwise.

(1) Adjust the vane 'open' microswitch, as follows:-

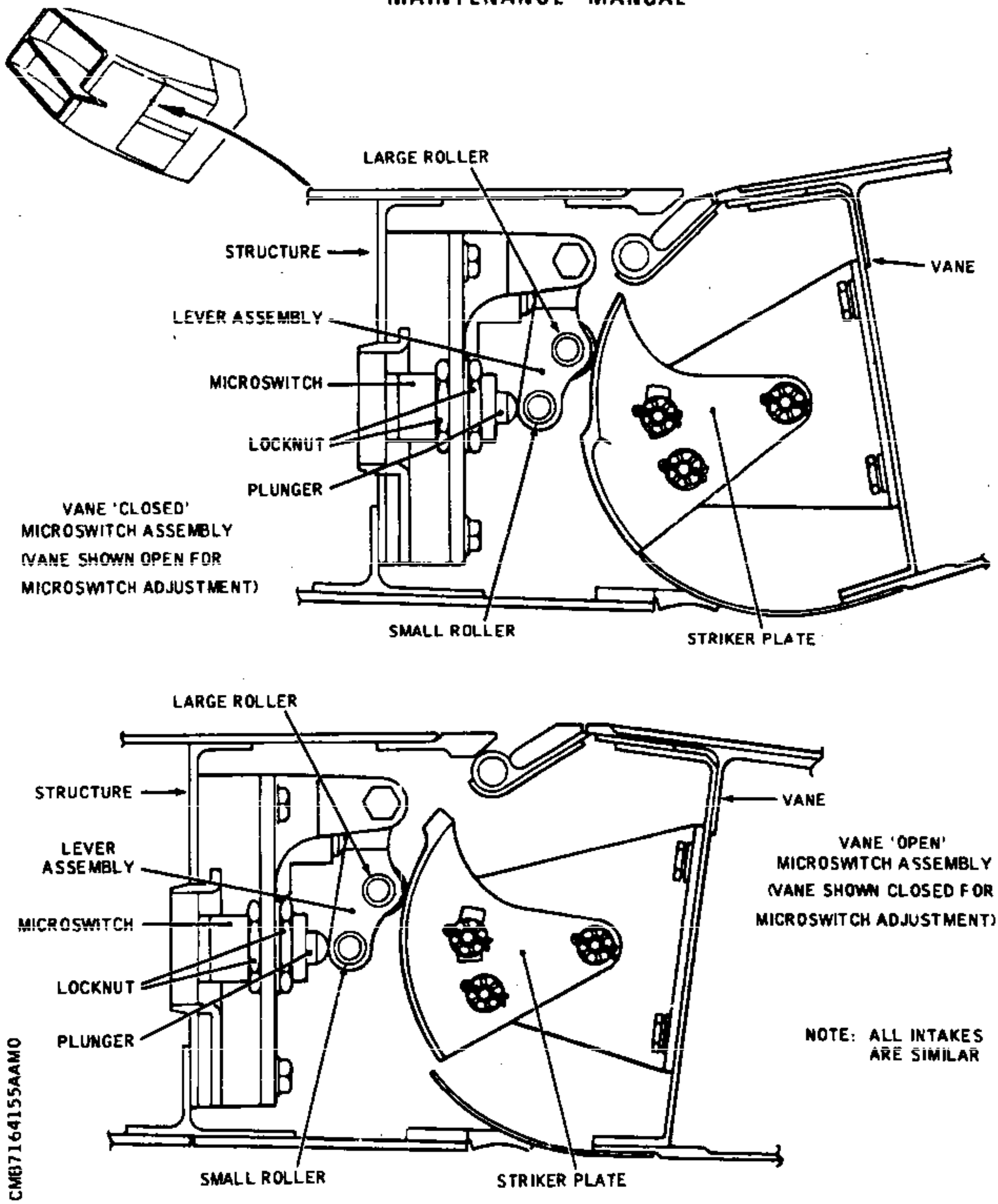
(a) Set the vane in the closed position.

(b) Loosen the microswitch locknuts.

(c) Ensure that the large roller of the lever assembly is in contact with the striker plate.

(d) Adjust the microswitch until its plunger is 0.10 in (2.54 mm) clear of the small roller on the lever; retain the microswitch in this position and tighten the locknuts.

(e) Disconnect the electrical cables of the microswitch from the appropriate terminal block (Ref. Table 501).



Microswitch - Adjustment
Figure 501

(f) Connect a test lamp and battery (or suitable alternative) to the electrical cables disconnected in operation (e).

INTAKE	TERMINAL BLOCK	VANE 'OPEN' MICROSWITCH TERMINALS
1	UG4213	A5 and B2
2	UG4217	A5 and B2
3	UG4221	A5 and B2
4	UG4225	A5 and B2

NOTE: All terminal blocks are located on the bottom outer longeron of the appropriate intake, near the spill door.

Microswitch Terminals
Table 501

(g) Fully open the vane and record the angle. The angle will be 31(±0.25) deg nominal for intakes 1, 2 and 3, 25(±0.25) deg nominal for intake 4, relative to the angle recorded in operation B.(16).

(h) Check that the test lamp is lit. If necessary, adjust the microswitch until the test lamp just comes on.

(i) With the test lamp lit, slowly move the vane toward the closed position; check that the test lamp goes out at -2.0(±0.2) deg of the angle recorded in operation (g) (e.g., if the vane fully-open angle is 31 deg, the test lamp must go out when the vane angle is 29(±0.2) deg).

(j) Continue to close the vane, checking that the test lamp remains out up to, and at, the fully closed position.

(k) Slowly open the vane and check that the test lamp comes on at -2.0(±0.2) deg of the angle recorded in operation (g), and

remains on up to, and at, the fully open position.

(l) Set the vane in the closed position; check that the test lamp has gone out.

(m) Torque-tighten the microswitch locknuts to between 75 and 85 lbf in (0.847 and 0.960 mdaN). Do not wire-lock the locknuts at this stage.

(n) Repeat operations (g) to (l).

(o) Interlock the microswitch locknuts with locking wire in accordance with 20-21-13.

(p) Disconnect the test lamp and battery from the microswitch electrical cables.

(q) Connect the electrical cables to the appropriate terminal block, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(r) Torque-tighten the terminal nuts to between 12 and 14 lbf in (0.136 and 0.158 mdaN) in accordance with 20-27-14.

(2) Adjust the vane 'closed' microswitch, as follows:-

(a) Fully open the vane; retain it in this position, using the support.

(b) Ensure that the large roller of the lever assembly is in contact with the track of the striker plate.

(c) Loosen the microswitch locknuts and move the microswitch away from the small roller of the lever assembly.

(d) Remove the support, close the vane to the position where the large roller is just clear of the bottom of the cam slope. Retain the vane in this position, using the support.

(e) Adjust the microswitch so that a gap of 0.140 in (3.556 mm) exists between the microswitch plunger and the small roller.

(f) Torque-tighten the microswitch locknuts to between 75 and 85 lbf in (0.847 and 0.960 mdaN). Interlock the locknuts with locking wire in accordance with 20-21-13.

(g) Fully open the vane; retain it in this position, using the support.

(h) Measure, and record, the length of the microswitch plunger.

(i) Remove the support; close and press down on the vane to ensure that it is fully closed. Check that -

i1) The length of the microswitch plunger is 0.200 in (5.080 mm) less than the measurement recorded in operation (h).

i2) The point of contact of the large roller has moved 0.100 in (2.540 mm) past the top peak of the cam.

(j) Using the AICS manual control in an inching mode, check that the large roller remains on the cam track when the spill door is fully open, as follows:-

<u>WARNING</u>: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE LOCKING PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

j1) Ensure that all equipment is clear of moving parts, and any panels are secured to prevent damage when the spill door is operated.

j2) Remove the locking pin from the hydraulic selector valve associated with the appropriate spill door and hydraulic system to be used.

j3) According to which hydraulic system is

to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

j4) Make available electrical ground power as detailed in 24-41-00.

j5) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

j6) At the intake management panel, remove the anti-interference plate. Using the appropriate SPILL switch in an inching mode, fully open the spill door.

j7) Switch off the hydraulic power supply.

j8) Check that the large roller is in contact with the cam track (i.e., the roller has not run off the end of the track).

j9) Pressurize the hydraulic system; hold the SPILL switch at "SHUT" and close the spill door. Release the switch.

j10) Depressurize the hydraulic system.

j11) Switch off and disconnect electrical ground power as detailed in 24-41-00.

j12) Trip the circuit breaker reset in operation j3) and fit a safety clip.

j13) Refit, and lock, the anti-interference plate to the intake management panel.

j14) Refit the locking pin removed in operation j2).

D. Conclusion

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(1) Remove the angle indicator.

(2) Refit the access panels previously removed.

(3) Carry out a Functional Test of the vane position indication system (Ref. para.3.).

3. Functional Test

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Protective cover, for intake lip	D926806000
Servicing extension (springboard)	-
Crawling board	-
Work stand	-

DESCRIPTION	PART NO.
Cover, for engine transition ring	D935036001
Support, for spill door when fully closed	-

B. Prepare to Test

(1) Ensure that the four intakes are clear of personnel and equipment.

(2) Position barriers to prevent persons from inadvertently entering the areas below the four spill doors, and position barriers (e.g., nets) over each intake entry to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel at the third crew member's (3CM) station to indicate that work is being carried out inside the engine intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Fit, and lock, the anti-interference plate.

(5) Fit locking pins to the spill door hydraulic selector valves of all intakes (Ref. 71-62-00, Servicing).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

(8) Fit, and secure, the protective cover to the intake lip.

(9) Position the work stand in front of the intake; place the servicing extension in the intake, resting it on the work stand and protective cover. Firmly secure the servicing extension to the work stand.

(10) Place the crawling board on the floor of the intake, aft of the servicing extension.

(11) Fit the cover to the engine transition ring.

C. Test

(1) Ensure that the spill door is fully closed and supported.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) With the vane fully closed, check that the associated magnetic indicator (on the intake management panel, above the ramp/spill master switch) displays SHUT.

(4) Slowly move the vane toward the fully open position, checking that the indicator displays diagonal stripes and then OPEN when the vane is fully open.

(5) Slowly move the vane toward the fully closed position, checking that the indicator displays diagonal stripes and then SHUT when the vane is fully closed.

(6) Switch off and disconnect electrical ground power as detailed in 24-41-00.

D. Conclusion

(1) Remove the support from beneath the spill door.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT, THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(2) Remove all tools and equipment from inside the intake, remove the marks of the angle indicator position and ensure that the intake is clean.

(3) Remove the locking pins from the hydraulic selector

valves of the four intakes.

(4) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.B.(6) and (7)).

(5) On the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) Leave the four RAMP/SPILL MASTER switches at the MAN position.

(c) Ensure that the four HYD switches are set at AUTO.

(6) Remove the warning placard from the engine start panel.

(7) Refit the access panels previously removed.

(8) Remove the barriers from beneath the four spill doors and from the intake entries.

SPILL DOOR POSITION INDICATOR RESOLVER ASSEMBLY - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:-

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

One resolver assembly is fitted on the structure forward of the spill door hinge at the centre wall position of each intake.

Access is gained after removal of panels from the underside of the appropriate nacelle at the centre wall position, and from the leading edge of the vane.

2. Spill Door Position Indicator Resolver Assembly (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Support, for spill door when	-

DESCRIPTION	PART NO.
fully closed	
Support, for vane when fully open	E925051000
Torque spanner, 25 to 30 lbf in (0.282 to 0.339 mdaN)	-
Torque spanner, 65 to 75 lbf in (0.734 to 0.847 mdaN)	-
R Aeroshell grease No.16 (Ref.20-30-00, No.51)	-
Pinion wrench, for resolver adjustment	F500/9
Locking wire type, size	-

B. Prepare to Remove Resolver Assembly

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel to indicate that work is being carried out on the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	2K2050	B5
AICU 4B SUP	2-213	4K2051	B14
R Engines 1, 2, 3 and 4			
R HYD GRND CHECK OUT R SEL VALVE CONT	15-216	M626	F22
R HYD GRND CHECK OUT R PUMP CONT	14-216	M656	A16

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
INT 1 RAMP & SPILL POSN IND	2-213	1E541	E14
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
INT 2 RAMP & SPILL POSN IND	4-213	2E541	E17
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION	3-213	3J1	E3

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
CONT			
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
INT 3 RAMP & SPILL POSN IND	4-213	3E541	F17
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6
INT 4 RAMP & SPILL POSN IND	2-213	4E541	F14

(8) The spill door must be fully closed, so, if applicable, close the door as follows:

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN
R TRIPPED, EXCEPT THE PIN REMOVED AND THE
R CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) Remove the locking pin from the hydraulic selector valve associated with the spill door resolver and the hydraulic system being used.

(c) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(d) Make available electrical ground power as detailed in 24-41-00.

(e) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(f) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "SHUT" until the spill door is fully closed. Release the switch.

(g) Depressurize the hydraulic system.

(h) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(i) Trip the circuit breaker reset in operation (c) and fit a safety clip.

(j) Refit the locking pin, removed in operation (b), to the selector valve.

(k) Refit, and lock, the anti-interference plate to the intake management panel.

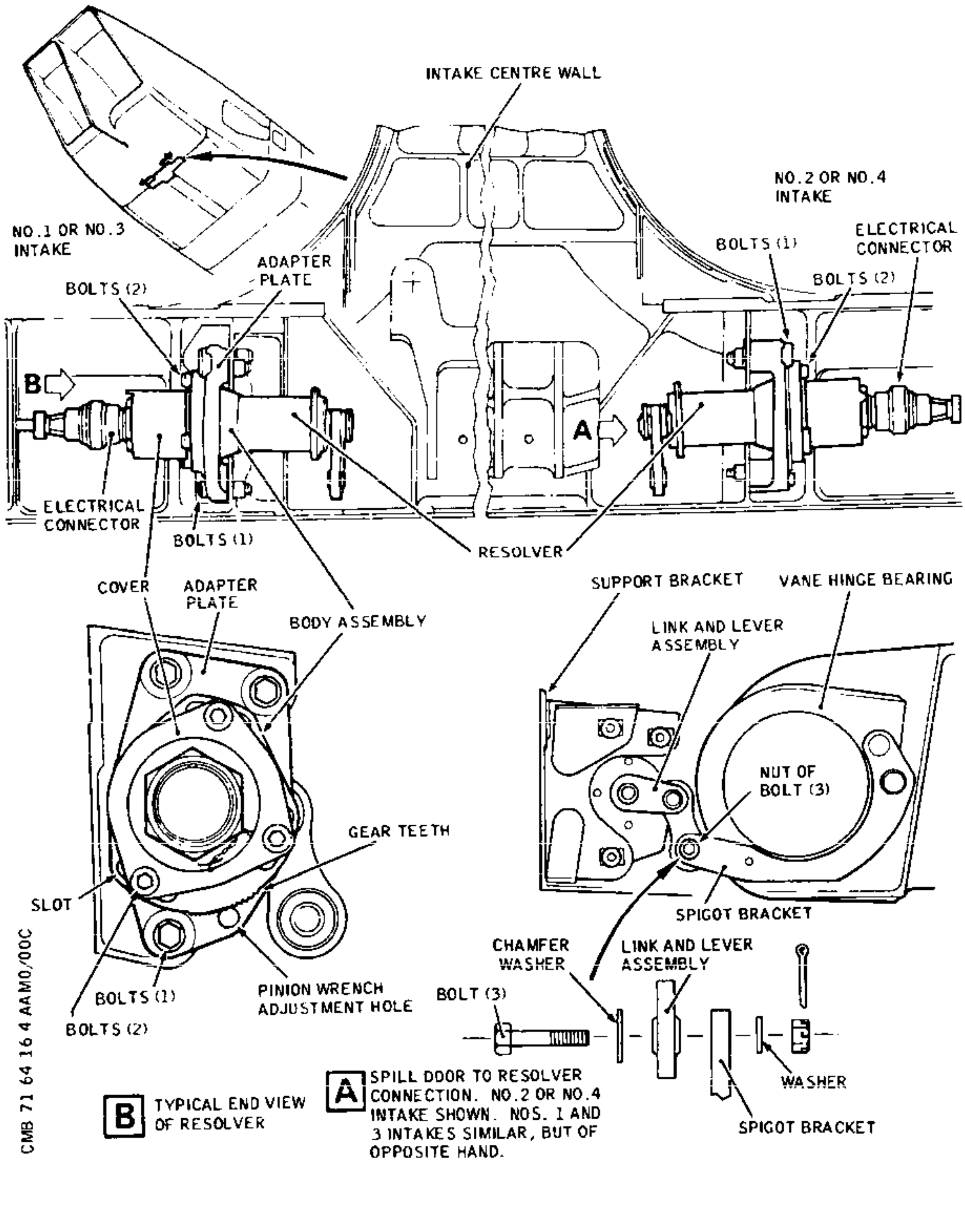
(9) Position a support beneath the spill door.

(10) Manually, fully open the vane; retain it in this position on a support.

R (11) Remove the appropriate access panel (411 HB or
R 431 HB) from the underside of the nacelle at the
R centre wall position and release and open the
R appropriate panel (411, 421, 431 or 441 PZ) from the
R leading edge of the vane.

C. Remove Resolver Assembly

(1) Disconnect the electrical connector from the



Spill Door Position Indicator
Resolver Assembly - Installation
Figure 401

R

resolver assembly.

(2) Remove the split pin, nut, washer, chamfer washer and bolt (3) securing the link and lever assembly to the spigot bracket.

(3) Support the resolver assembly and remove the three bolts (1).

(4) Disengage and remove the resolver assembly from the aircraft.

D. Prepare to Install Resolver Assembly

(1) Insert the pinion wrench in its hole in the adapter plate, ensuring that the wrench fully engages the gear teeth.

(2) Using the wrench, check that the resolver body assembly can be rotated, but with some resistance (i.e., not too easily). If necessary, loosen or tighten the three bolts (2) to achieve this condition.

(3) Set the gear teeth central (approximately) about the hole in the adapter plate. Remove the wrench.

E. Install Resolver Assembly

(1) Ensure that the safety precautions taken in operations B.(2) to (6) have not been cancelled.

(2) Apply sealant in accordance with 20-22-12 to the mating faces of the adapter plate and the support bracket.

(3) Position the resolver assembly in the support bracket; lightly coat the bolts (1) with Aeroshell grease No.16 and fit them to secure the resolver assembly.

(4) Torque-tighten the bolts to between 65 and 75 lbf in (0.734 and 0.847 mdaN).

(5) Interlock the two top bolts (1) and lock the bottom bolt (1) to the adapter plate with locking wire in accordance with 20-21-13.

(6) Lightly coat the bolt (3) with Aeroshell grease No.16.

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CAUTION: IN OPERATION (7), THE LINK AND LEVER ASSEMBLY MUST BE CONNECTED TO THE SPIGOT BRACKET IN THE CORRECT POSITION, OTHERWISE ERRONEOUS ELECTRICAL SIGNALS WILL RESULT.

THE NUT OF THE BOLT (3) MUST FACE THE NACELLE CENTRE WALL.

(7) Position the link and lever assembly as illustrated (Ref. Fig. 401) (Detail A). Fit the bolt (3), chamfer washer (with chamfer toward the bolt head), washer and nut. Torque-tighten the nut to between 25 and 30 lbf in (0.282 and 0.339 mdaN). Fit a split pin.

NOTE: If a new spill door has been fitted, it may be necessary to adjust the position of the resolver to align correctly the link with the spill door assembly. This is effected by removing the existing packing and fitting new packing (up to two pieces) of the appropriate thickness (Ref. Fig. 401). Secure the packing with Viton in accordance with 20-22-12.

(8) Operate the spill door and check the link for freedom of rotational movement and clearance, as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) Remove the locking pin from the hydraulic selector valve associated with the spill door and the hydraulic system being used.

(c) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref.

para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(d) Make available electrical ground power as detailed in 24-41-00.

(e) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

WARNING: AFTER OPERATION (f), DO NOT LEAVE THE PANEL UNGUARDED UNTIL THE CHECK IS CONCLUDED.

(f) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "OPEN" until the spill door is 10 per cent (approximately) open. Release the switch.

(g) Switch off the hydraulic power supply.

(h) Check that the link is free to rotate about the spherical bearings (i.e., the link is not in immovable contact with the sides of the lever fork).

(i) Check that a clearance exists around the link, particularly at the ends.

(j) Switch on the hydraulic power supply.

(k) Hold the SPILL switch at "OPEN" until the spill door is opened a further 10 per cent. Release the switch.

(l) Repeat operations (g), (h) and (i).

(m) Repeat operations (j) and (k), opening the spill door a further 10 per cent, followed each time by operations (g), (h) and (i), until the spill door is fully open.

(n) Hold the SPILL switch at "SHUT" until the spill door is fully closed. Release the switch.

(o) Depressurize the hydraulic system.

(p) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(q) Trip the circuit breaker reset in operation (c) and fit a safety clip.

(r) Refit the locking pin, removed in operation (b), to the selector valve.

(s) Refit the anti-interference plate to the intake management panel.

F. Conclusion

(1) Remove the support and fully close the vane.

(2) Remove the support from beneath the spill door.

(3) Adjust, connect the electrical connector to, and carry out a Functional Test of the resolver assembly as detailed in Adjustment/Test.

SPILL DOOR POSITION INDICATOR RESOLVER ASSEMBLY - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

AN INTAKE MUST NOT BE ENTERED, OR WORKED ON, UNTIL THE SPILL DOOR AND RAMPS OF ALL INTAKES HAVE BEEN ELECTRICALLY AND HYDRAULICALLY ISOLATED, AS FOLLOWS:

(1) LOCKING PINS MUST BE FITTED TO THE SPILL DOOR HYDRAULIC SELECTOR VALVES (TWO VALVES FOR EACH INTAKE).

(2) ALL APPROPRIATE CIRCUIT BREAKERS MUST BE TRIPPED AND SAFETY-CLIPPED.

(3) THE ANTI-INTERFERENCE PLATE MUST BE FITTED TO THE INTAKE MANAGEMENT PANEL.

1. General

One resolver assembly is fitted on the structure forward of the spill door hinge at the centre wall position of each intake.

Each resolver assembly is electrically adjusted during manufacture or overhaul and should not require further adjustment after installation on an aircraft.

To make the indicator displays (0 and 100 per cent) compatible with the signals from the associated resolver, any adjustment should be made at the appropriate potentiometers of the indicator.

If adjustment of the assembly is required, access is gained after the removal of panels from the underside of the appropriate nacelle at the centre wall position, and from the leading edge of the vane.

This topic contains the adjustment procedures, and a Functional Test to prove the integrity of the spill door position indication system, under the following headings:-

Resolver Assembly Adjustment

Indicator Potentiometers Adjustment

Functional Test

After any adjustment a Functional Test must be carried out,

but the Test may be used at any time to check the integrity of the system.

Operational and System Tests are not applicable in this instance.

2. Resolver Assembly Adjustment

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Support, for spill door when fully closed	-
Support, for vane when fully open	E925051000
Torque spanner, 25 to 30 lbf in (0.282 to 0.339 mdaN)	-
R Resolver test set (includes power loom Pt. No.TE6049201 and ramp resolvers loom Pt. No.TE6049203)	TE6049000
Pinion wrench, for resolver adjustment	F500/9
Locking wire	-

B. Prepare to Adjust Resolver Assembly

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill

doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel to indicate that work is being carried out on the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switch to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 2 RH IGNITION CONT	1-213	1J2	N6

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 1 RAMP & SPILL POSN IND	2-213	1E541	E14
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
INT 2 RAMP & SPILL POSN IND	4-213	2E541	E17
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
INT 3 RAMP & SPILL POSN IND	4-213	3E541	F17
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6
INT 4 RAMP & SPILL POSN IND	2-213	4E541	F14

(8) The spill door must be fully closed, so, if applicable, close the door as follows:-

<u>WARNING:</u> ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) Remove the locking pin from the hydraulic selector valve associated with the spill door resolver and the hydraulic system to be used.

(c) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(d) Make available electrical ground power as detailed in 24-41-00.

(e) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(f) At the intake management panel, remove the anti-interference plate; hold the appropriate SPILL switch at "SHUT" until the spill door is fully closed. Release the switch.

(g) Depressurize the hydraulic system.

(h) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(i) Trip the circuit breaker reset in operation

(c) and fit a safety clip.

(j) Refit the locking pin, removed in operation (b), to the selector valve.

(k) Refit, and lock, the anti-interference plate to the intake management panel.

(9) Position a support beneath the spill door.

(10) Manually, fully open the vane: retain it in this position on a support.

R (11) Remove the appropriate access panel (411 HB or 431 HB)
R from the underside of the nacelle at the centre wall
R position and release and open the appropriate panel
R (411, 421, 431 or 441 PZ) from the leading edge of
R the vane.

(12) If applicable, disconnect the electrical connector from the resolver.

(13) Connect the resolver test set as follows:-

(a) Ensure that the ON - OFF switch on the test set is at the OFF position.

(b) Connect the appropriate end of the power loom to the connector PL1 on the test set and connect the other end to a 115 V 400 Hz electrical supply.

(c) Connect the single end of the ramp resolver loom to the connector PL2 on the test set and connect the appropriate tail to the fixed connector on the resolver.

(d) On the test set, set the RESOLVER SELECT switch to "INDICATION".

(e) Set the ON - OFF switch to "ON"; check that the angle position indicator is illuminated.

C. Adjust Resolver Assembly

(1) Insert the pinion wrench in the hole in the adapter plate, ensuring that the wrench fully engages the gear teeth.

(2) Rotate the resolver body until the test set reading agrees with that listed in Table 501 for the

appropriate intake.

INTAKE	TEST SET READING
1 or 3	40(±1.0) deg
2 or 4	50(±1.0) deg

Resolver Signals
Table 501

(3) Remove the pinion wrench.

(4) Torque-tighten the three socket-head bolts (securing the cover and body to the adapter plate) to between 25 and 30 lbf in (0.282 and 0.339 mdaN).

(5) Check that the test set reading still agrees with that listed in Table 501.

(6) Switch off the test set and then disconnect the loom from the resolver.

(7) Reconnect the electrical connector to the resolver, ensuring that the mating surfaces are clean and undamaged.

(8) Interlock the three bolts with locking wire in accordance with 20-21-13.

(9) Remove the support and close the vane.

(10) Remove the support from beneath the spill door.

(11) Check that the resolver signals and indicator displays are compatible and adjust the potentiometers, if required (Ref. para.3.).

3. Indicator Potentiometers Adjustment

WARNING: OBSERVE THE WARNING AT THE HEAD OF PAGE 501.

A. Prepare to Adjust Potentiometers

(1) If applicable, carry out operations 2.B.(1) to

(7).

B. Adjust Potentiometers

(1) Remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.2.B.(7)):-

INT (1, 2, 3 or 4) RAMP & SPILL POSN IND.

(2) Apply electrical and hydraulic power as follows:-

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

(a) Ensure that all equipment is clear of moving parts.

(b) Remove the locking pin from the hydraulic selector valve associated with the spill door resolver and the hydraulic system to be used.

(c) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.2.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

(d) Make available electrical ground power as detailed in 24-41-00.

(e) Pressurize fully the appropriate hydraulic system (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intakes.

(3) Remove the interference plate from the intake

management panel. Hold the appropriate SPILL switch at "SHUT" and check that the associated position indicator displays 0 per cent.

(4) If necessary, release the manual control panel (Ref. 71-61-22) to gain access to the associated spill door position indicator zeroing potentiometer, No.1 ENGINE RV5, No.2 ENGINE RV11, No.3 ENGINE RV5 or No.4 ENGINE RV11, as applicable. Adjust as necessary to align the indicator pointer with the 0 per cent graduation on the scale. Release the SPILL switch.

(5) Ensure that the access panels are secured so that they will not cause damage when the spill door is opened.

(6) Ensure that the spill door operating area is clear of persons and equipment.

(7) Hold the SPILL switch at "OPEN" until the spill door is fully open; release the switch.

(8) Check that the position indicator displays 100 per cent.

(9) If necessary, adjust the associated spill door position full scale adjusting potentiometer, No.1 ENGINE RV6, No.2 ENGINE RV12, No.3 ENGINE RV6 or No.4 ENGINE RV12, as applicable. Adjust as necessary to align the indicator pointer with the 100 per cent graduation on the scale.

(10) Hold the SPILL switch at "SHUT". Recheck that the spill door position indicator displays 0 per cent when the spill door is fully closed. If necessary, readjust the potentiometer until the indicator reading is correct, then repeat operations (5) to (9). Repeat this process until the indicator reading is correct at 0 per cent and 100 per cent (this procedure is necessary because of interaction between the two trim potentiometers).

(11) Hold the SPILL switch at "SHUT" until the spill door is fully closed; release the switch.

(12) Electrically and hydraulically isolate the spill door and ramps, as follows:-

(a) Depressurize the hydraulic system.

(b) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(c) Trip the circuit breaker reset in operation (2)(c) and fit a safety clip.

(d) Refit the locking pin, removed in operation (2)(b), to the selector valve.

(e) Refit, and lock, the anti-interference plate to the intake management panel.

(13) Refit the manual control panel (Ref. 71-61-22).

(14) Carry out a Functional Test (Ref. para.4.).

4. Functional Test

WARNING: ENSURE THAT ALL INTAKE INTERIORS, SPILL DOORS AND MECHANISMS ARE CLEAR OF PERSONS, AND THAT BARRIERS ARE IN POSITION BELOW ALL SPILL DOORS AND OVER ALL INTAKE ENTRIES.

ALL LOCKING PINS MUST REMAIN FITTED AND ALL CIRCUIT BREAKERS MUST REMAIN TRIPPED, EXCEPT THE PIN REMOVED AND THE CIRCUIT BREAKER RESET IN THE FOLLOWING PROCEDURES.

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins, for selector valves	E925037000
Locking pins, for selector valves	E925038000
Anti-interference plate, for intake management panel	E925068000
Angle indicator, (or suitable alternative) for measuring spill door angles	D920327000

B. Prepare to Test

(1) Ensure that the four intakes are clear of persons and equipment.

(2) Position barriers to prevent persons from inadvertently entering the area below the four spill doors, and position barriers (e.g., nets) over the four intake entries to prevent persons from entering the intakes, particularly when hydraulic power is applied.

(3) Display a warning placard on the engine start panel to indicate that work is being carried out on the intakes.

(4) On the intake management panel (Ref. 71-61-00), proceed as follows:-

(a) Set the four RAMP/SPILL MASTER switches to "MAN".

(b) Set the appropriate HYD switches to the system which will be used (i.e., green, blue or yellow).

(c) Fit, and lock, the anti-interference plate.

(5) Fit locking pins (Ref. 71-62-00, Servicing) to the hydraulic selector valves of the four intakes (two valves for each intake).

(6) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
INT 1 MAIN HYD SUP	1-213	1K1950	D9
INT 1 ST'BY HYD SUP	15-216	1K1960	B8
AICU 1A SUP	2-213	1K2050	D14
AICU 1B SUP	14-216	1K2051	A5
Engine 2			
INT 2 MAIN HYD SUP	15-215	2K1950	B18

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 2 ST'BY HYD SUP	1-213	2K1960	E9
AICU 2A SUP	13-216	2K2050	A3
AICU 2B SUP	2-213	2K2051	H14
Engine 3			
INT 3 MAIN HYD SUP	5-213	3K1950	A7
INT 3 ST'BY HYD SUP	15-215	3K1960	C18
AICU 3A SUP	2-213	3K2050	H13
AICU 3B SUP	13-216	3K2051	B3
Engine 4			
INT 4 MAIN HYD SUP	15-216	4K1950	A8
INT 4 ST'BY HYD SUP	5-213	4K1960	A6
AICU 4A SUP	14-216	4K2050	B5
AICU 4B SUP	2-213	4K2051	B14
Engines 1, 2, 3 and 4			
HYD GRND CHECK OUT SEL VALVE CONT	15-216	M626	F22
HYD GRND CHECK OUT PUMP CONT	14-216	M656	A16

(7) Trip the following circuit breakers of the appropriate adjoining intakes (i.e., 1 and 2, or 3 and 4); fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine 1			
ENG 1 & 4 AIR START CONT	15-215	K181	C15

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 1 LH IGNITION CONT	3-213	1J1	E1
ENG 1 RH IGNITION CONT	1-213	1J2	N6
Engine 2			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 2 LH IGNITION CONT	3-213	2J1	E2
ENG 2 RH IGNITION CONT	1-213	2J2	P6
Engine 3			
ENG 2 & 3 AIR START CONT	15-216	K182	D11
ENG 3 LH IGNITION CONT	3-213	3J1	E3
ENG 3 RH IGNITION CONT	1-213	3J2	Q6
Engine 4			
ENG 1 & 4 AIR START CONT	15-215	K181	C15
ENG 4 LH IGNITION CONT	3-213	4J1	E4
ENG 4 RH IGNITION CONT	1-213	4J2	R6

(8) With the spill door fully closed, attach one end of the angle indicator to the spill door, as near as possible to the trailing edge, on a fore-and-aft line at the centre wall position. Attach the other end of the indicator to the intake structure.

(9) Record the angle shown on the indicator scale.

C. Test

(1) Ensure that the panels on the leading edge of the vane and spill door are secured so that they will not cause damage when the spill door is operated.

(2) Ensure that the spill door operating area is clear of persons and equipment.

(3) Remove the locking pin from the hydraulic selector valve associated with the resolver being tested and the hydraulic system to be used.

(4) According to which hydraulic system is to be used and which spill door is being operated, remove the safety clip and reset the appropriate one of the following circuit breakers (Ref. para.B.(6)):-

INT (1, 2, 3 or 4) MAIN HYD SUP, or

INT (1, 2, 3 or 4) ST'BY HYD SUP.

WARNING: AFTER OPERATION (5), DO NOT LEAVE THE PANEL UNGUARDED UNTIL THE TEST IS CONCLUDED.

(5) Remove the anti-interference plate from the intake management panel.

(6) Make available electrical ground power as detailed in 24-41-00.

(7) Pressurize the appropriate hydraulic system to the normal operating pressure (Ref. Chap.29), with the application of power controlled by a responsible person associated with work on the intake.

(8) On the intake management panel, hold the appropriate SPILL switch at "OPEN" until the spill door is fully open. Release the switch.

WARNING: KEEP CLEAR OF THE SPILL DOOR OPERATING AREA WHILST CHECKING INDICATOR READING.

(9) Check that the angle indicator shows an angle, relative to the angle recorded in operation B.(9), for the appropriate spill door, as follows:-

(a) For intakes 2 or 3: 37(±0.7) deg.

(b) For intakes 1 or 4: 36.3(±0.7) deg.

(10) Check that the associated spill door position indicator displays 100 per cent.

(11) Hold the SPILL switch at "SHUT" until the spill door is fully closed. Check that the indicator displays 0 per cent, and then release the switch.

(12) Depressurize the hydraulic system.

(13) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(14) Refit, and lock, the anti-interference plate to the intake management panel.

(15) Trip the circuit breaker reset in operation (4) and fit a safety clip.

(16) Refit the locking pin, removed in operation (3), to the selector valve.

D. Conclusion

(1) Remove the angle indicator from the spill door and structure.

CAUTION: AFTER REMOVAL OF TOOLS AND EQUIPMENT, THOROUGHLY CHECK THE INTAKE INTERIOR FOR FREEDOM FROM DEBRIS AND LOOSE OBJECTS.

(2) Remove all tools and equipment from the intake, and ensure that the intake interior is clean.

(3) Remove the locking pins from the hydraulic selector valves of the four intakes.

(4) Refit the access panels previously removed.

(5) At the intake management panel, proceed as follows:-

(a) Remove the anti-interference plate.

(b) Set all HYD switches to "AUTO".

(c) Leave the four RAMP/SPILL MASTER switches at the MAN position.

(6) Remove the safety clips and reset the circuit breakers previously tripped (Ref. paras.B.(6) and (7)).

(7) Remove the warning placard from the engine start panel.

(8) Remove the barriers from the intake entries and from beneath the spill doors.

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R

ENGINE DRAINS - DESCRIPTION AND OPERATION

1. General

The engine drains provide for fuel and oil drainage from static seals and glands. The drained fluids are contained within separate systems and either spilled overboard or directed into a drains tank. Rigid and flexible tubes are secured externally on the engine and connect to seal plates which form the overboard spills. The seal plates contact the engine bay doors to complete the isolation of the drains from the interior of the engine bay.

The description of the fuel drain system is given in 71-73-00, and the oil drain system in 71-79-00.

FUEL DRAINS - DESCRIPTION AND OPERATION

1. General

The fuel drains include separate drainage systems for static seals of components and tube joints, component drive glands,
R fuel system dump and for reheat duct and exhaust diffuser drains.

Static seals of fuel system components and flanged joints have primary and secondary seals that form a seal failure drainage space. Internal passages connect to an outlet connection on the component that provides for the connection of the seal failure drains system tubes, a typical example is shown in the illustration (Ref. Fig.001).

2. Tubes, Component Connections to Overflow Vent (Ref.Fig.002 and 003)

The seal failure drains system is formed by two branches of interconnected flexible tubes that connect finally to two rigid tubes. These tubes terminate at the two connections of a multiple connector on the drains tank fuel/air separator and overflow vent. The flexible tubes connect by union nuts or the fluid passage bolts retaining multiple connectors to the component drain outlets. Bracket mounted connectors are used for tube junctions and clamp assemblies support the tubes between connections.

3. Tubes, First Stage Pump and FCU to Connection at Second Stage Pump - (Gland Drains) (Ref.Fig.004)

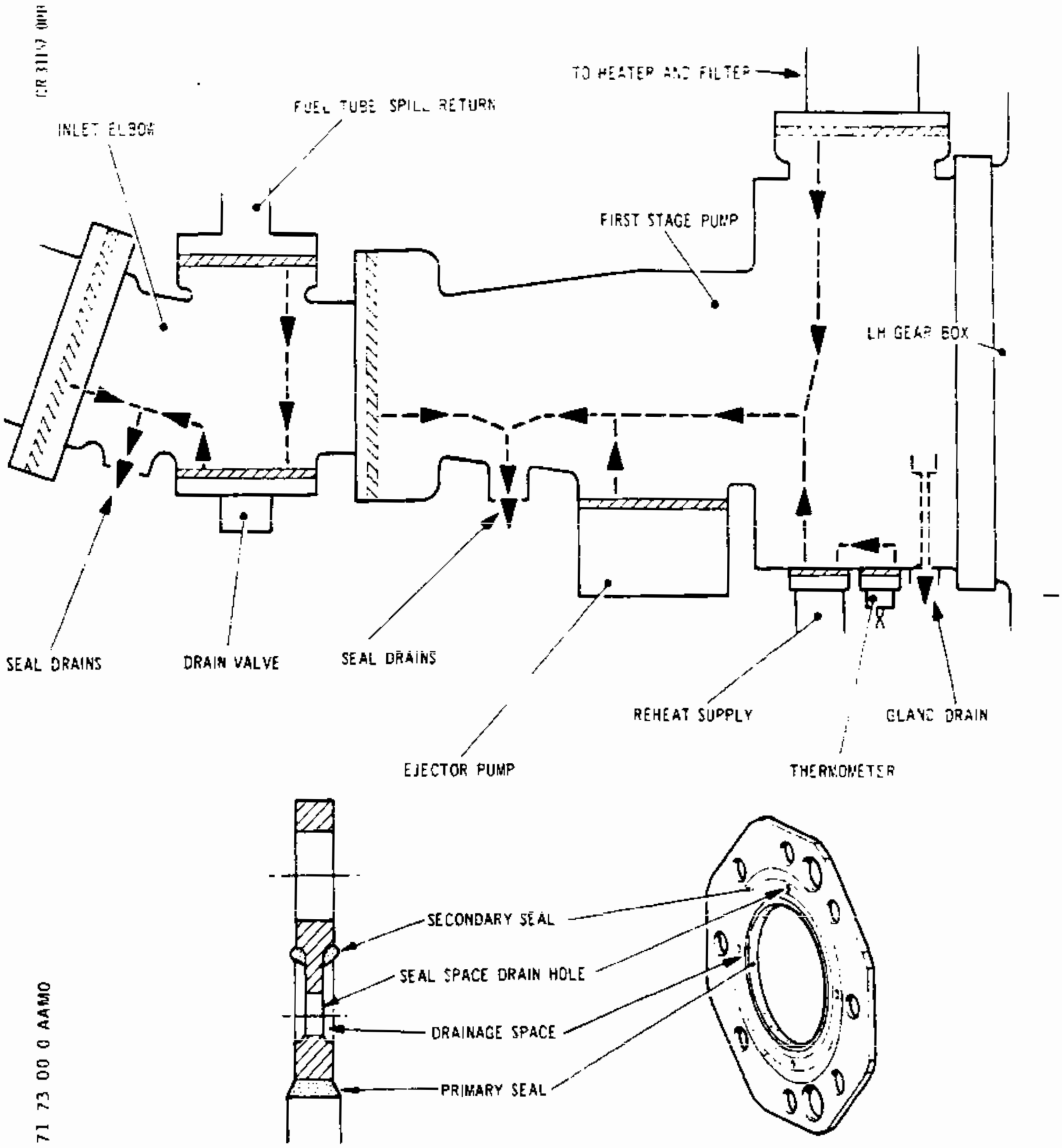
A branched rigid tube connects to the first stage pump gland drain outlet by a fluid passage bolt and to the FCU gland drain outlet by a union nut. The outlet end of the tube is secured to a connection on the flanged elbow bolted to the second stage pump fuel/air drain outlet. A clamp assembly supports the tube near the main oil pump case.

4. Tubes, Second Stage Pump to Tank - (Gland Drains) (Ref.Fig.004)

A rigid tube for the combined gland drains and fuel/air drains connects between the flanged elbow outlet of the second stage pump and the inlet to the fuel/air separator of the drains tank. The tube is secured by a union nut at each end and supported by a clamp assembly.

5. Tubes, Distribution and Dump Valve, Dump Outlet to Tank (Ref.Fig.004)

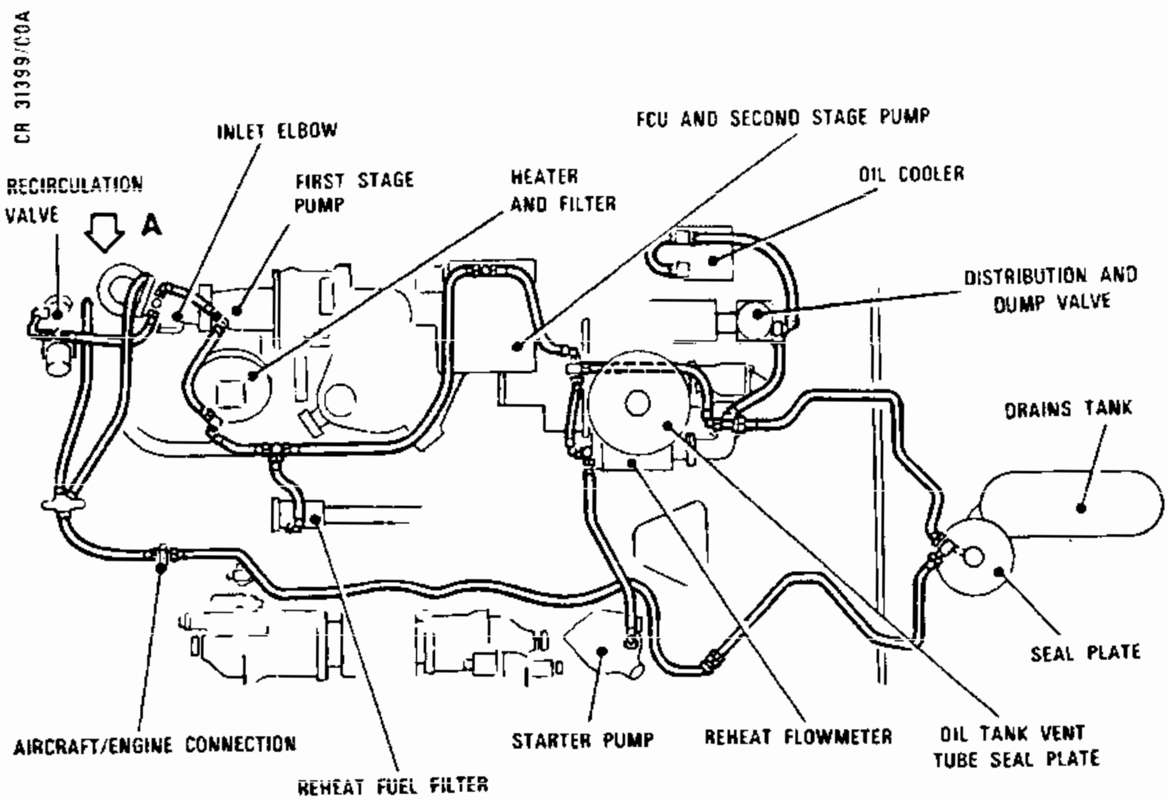
The dump valve rigid drain tube connects between the distri-



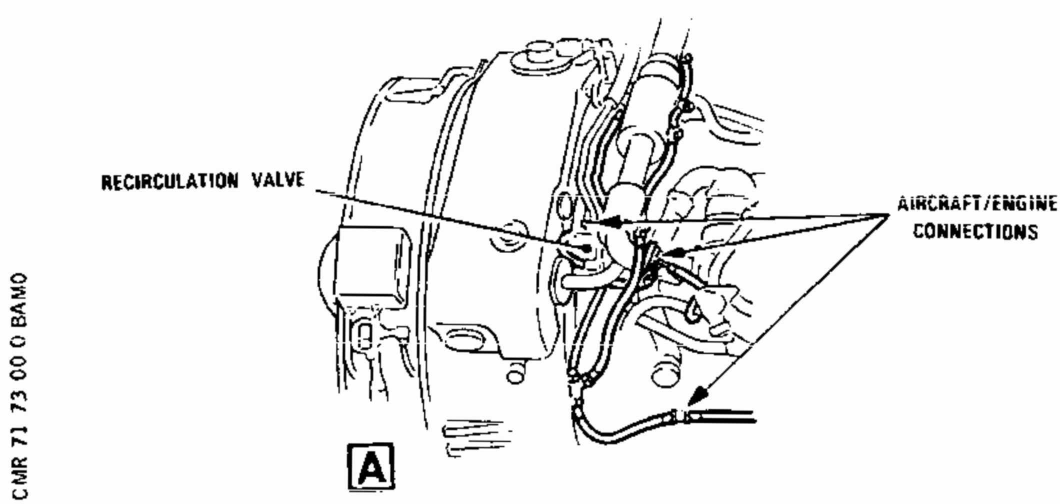
TYPICAL SEAL PLATE

Internal Seal Failure Drains
Figure 001

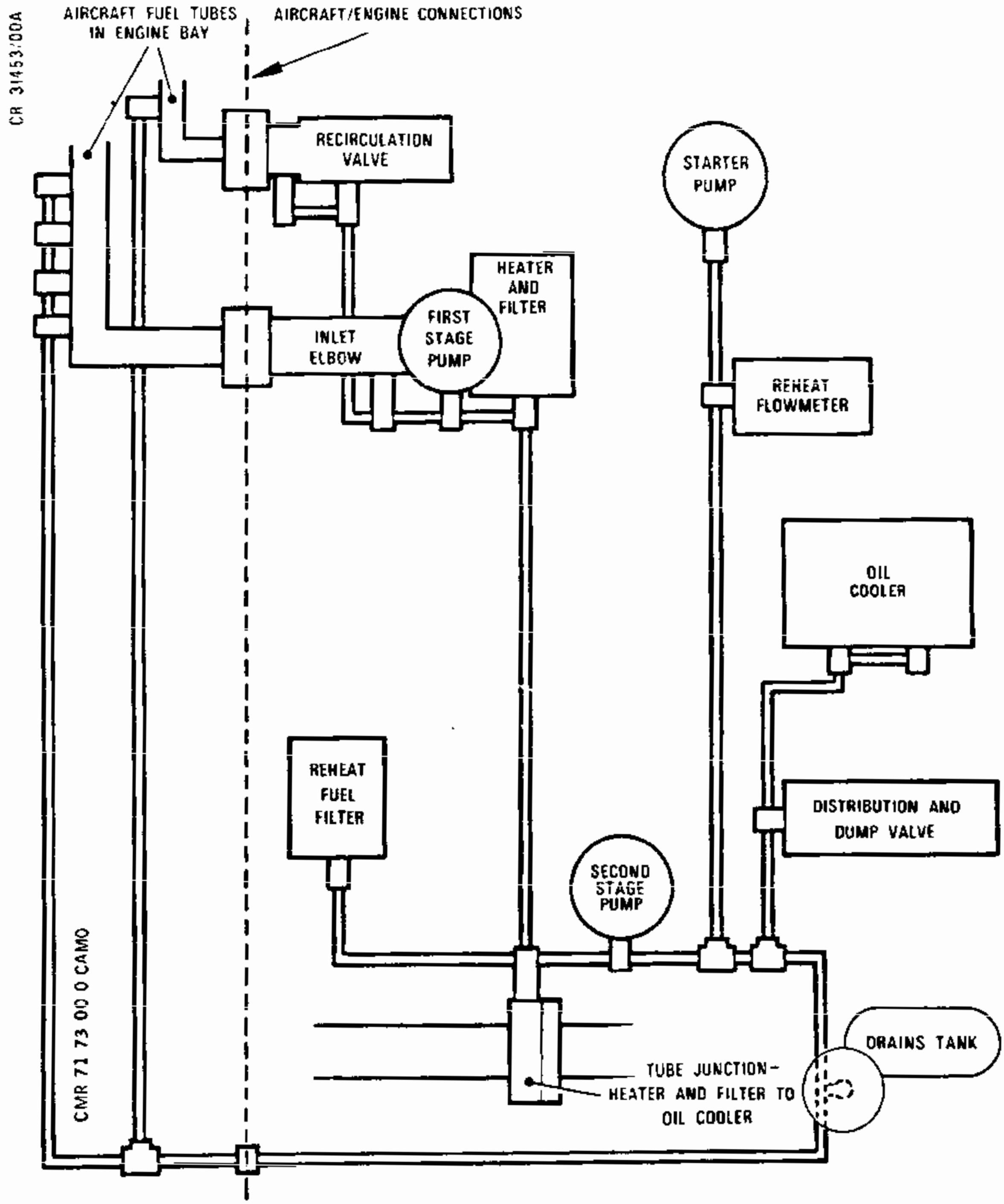
R



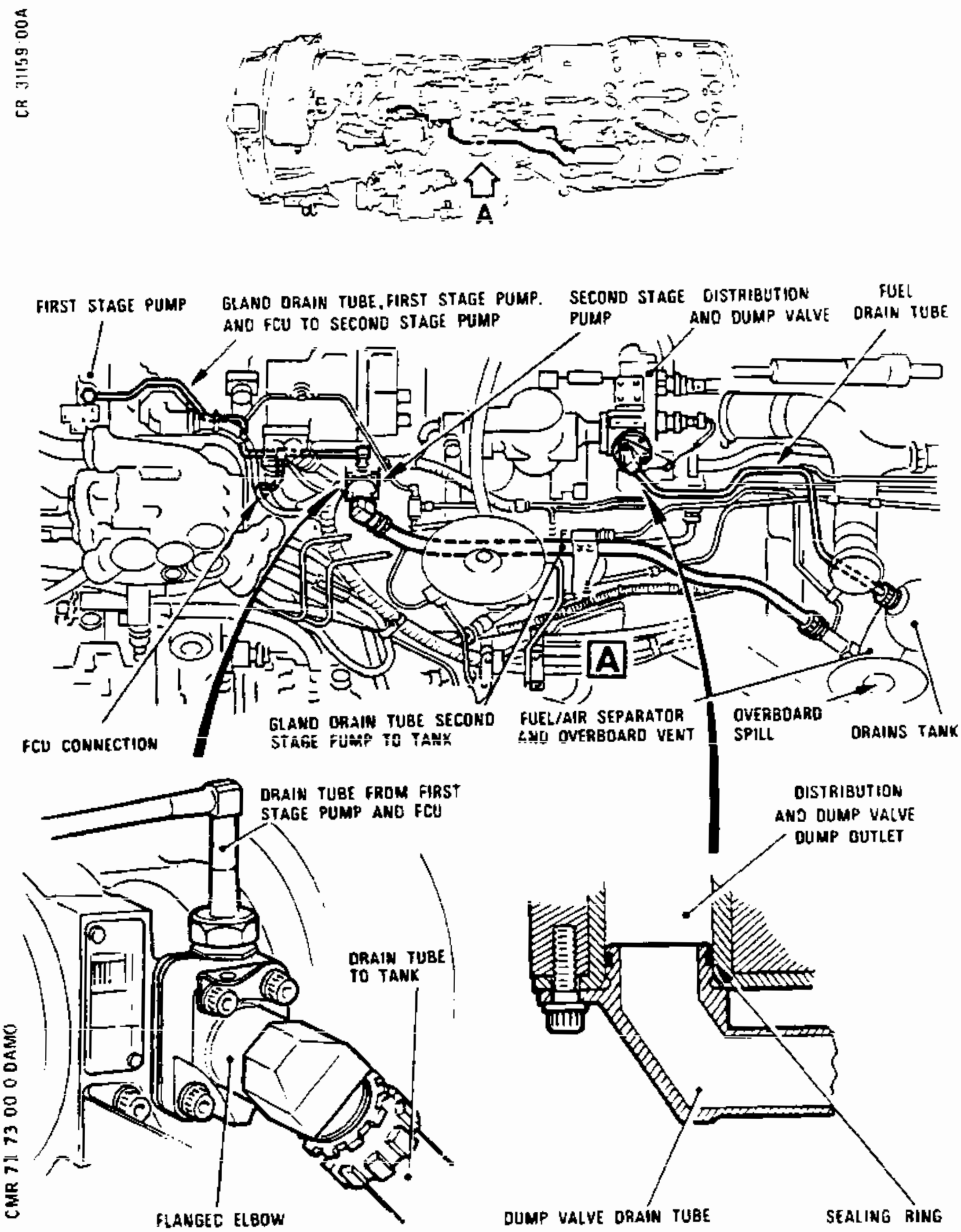
VIEW ON UNDERSIDE OF ENGINE



Static Seal Failure Drains System
Figure 002



Static Seal Failure Drains System
Diagrammatic
Figure 003



Dump Valve Drain and Gland Drains Tubes
Figure 004

bution and dump valve and the drains tank. The tube connection at the distribution and dump valve is a flanged and spigoted joint sealed by a toroidal sealing ring and secured by three bolts. A union nut secures the tube to the drains tank connection and a clamp assembly supports the tube at the rear flange of the delivery casing.

6. Drains Tank (Ref. Fig. 005)

The cylindrical drains tank is mounted below the combustion chamber outer casing. Three lugs provide for attachment to engine mounted brackets at the rear and left-hand side positions and a fourth lug provides for a mounting link at the right-hand side.

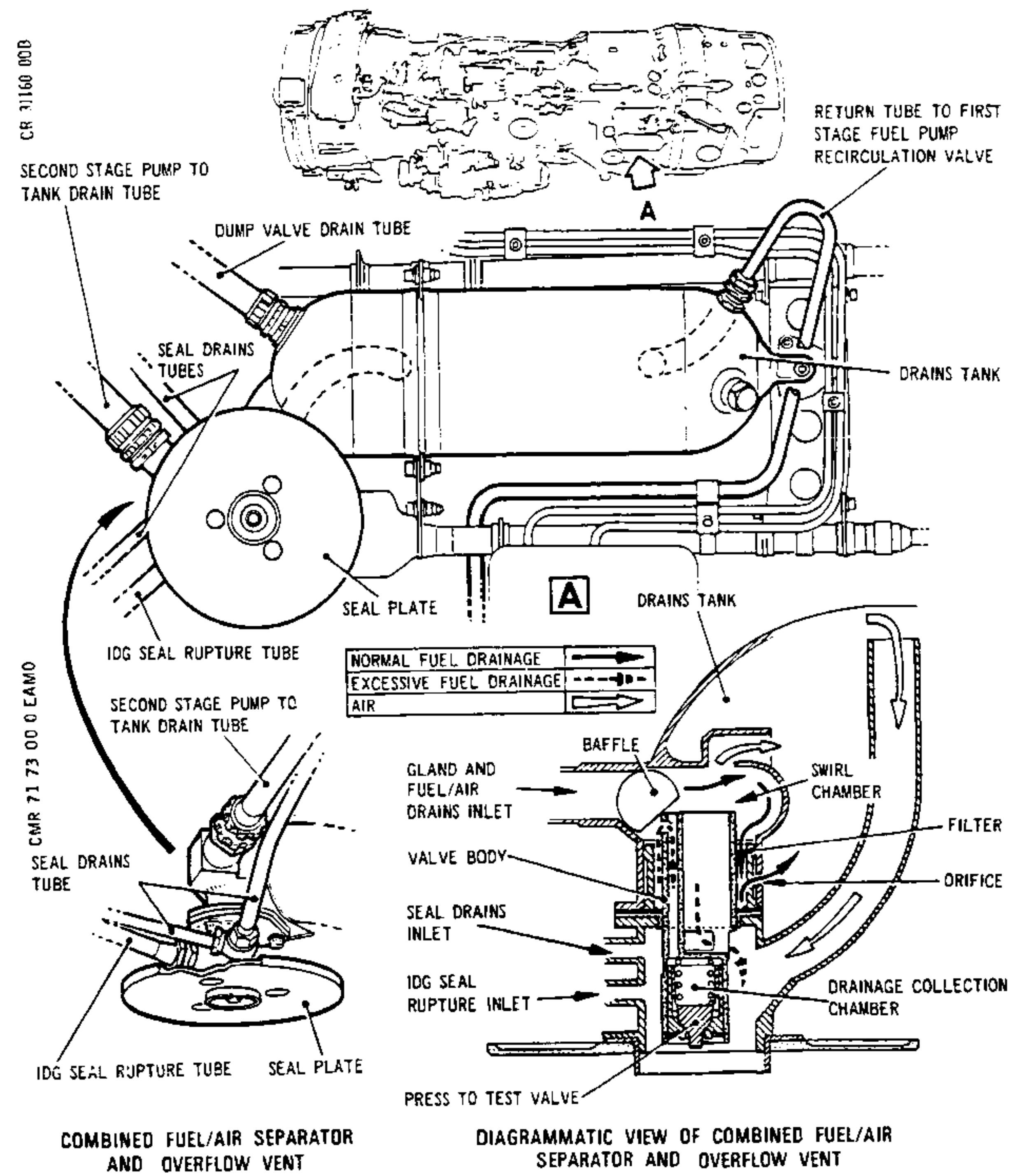
Inlet connections at the front of the tank are provided for the fuel dump drain system and the gland drain system. Union nut connections are used for both systems. An outlet connection at the rear of the tank is provided for the tube union of the drains tank to first stage pump/recirculation valve fuel return tube. The fuel dump drain connection is integral with the tank and is open direct to the tank interior.

The inlet connection for the gland drains system is incorporated in the fuel/air separator and overflow vent. The fuel separator section is integral with the drains tank and forms a swirl chamber containing a baffle. The overflow vent section is bolted to the underside of the fuel separator to enclose the valve body. The cylindrical valve body, located by a flange between the vent and separator sections, has an excessive drainage collection chamber and a vent passage. The vent is open to the swirl chamber at the top and has exit ports at the bottom. The drainage collection chamber positioned below the vent passage has an inlet passage, formed by the valve body, leading from the swirl chamber and has its outlet sealed by a spring loaded, press-to-test, valve. A filter is housed in the annular space formed between the top half of the valve body and the fuel separator from which a passage, with a restricted orifice, leads into the tank interior. A tube open to the tank interior at the top connects via a passage in the fuel separator to the open overflow vent.

The overflow vent has connections for the seal failure drains system tubes at a multiple connector a connection for the IDG seal rupture tube (Ref.71-79-00) and provision for attachment of the seal plate.

R 7. Exhaust Diffuser and Reheat Duct Drain System (Ref. Fig. 006)

The exhaust diffuser drain system consists of a drain assembly with seal plate mounted on the diffuser casing and includes



Drains Tank with Combined Fuel/Air
Separator and Overflow Vent
Figure 005

R

R drain tubes from the fuel collector on the bottom of the rear
R of the spherical flange case and from the half deflector
R (bottom) at the junction of the reheat duct and primary
R nozzle. The drain assembly is secured by four bolts to the underside of the diffuser case where it locates with a drain hole in the case. The seal plate installed on the drain block maintains the enclosure of the drain system when it mates with the engine bay door overboard spill.

The upper and lower bodies of the drain assembly are bolted together and contain two spring-loaded plate valves. Four fluid passage slots are provided in the side of each bore housing the valves. The drain tubes from the front and rear of the jet pipe join at a common connector where a single tube connects to the drain block.

8. Operation of Seal Failure Drains System

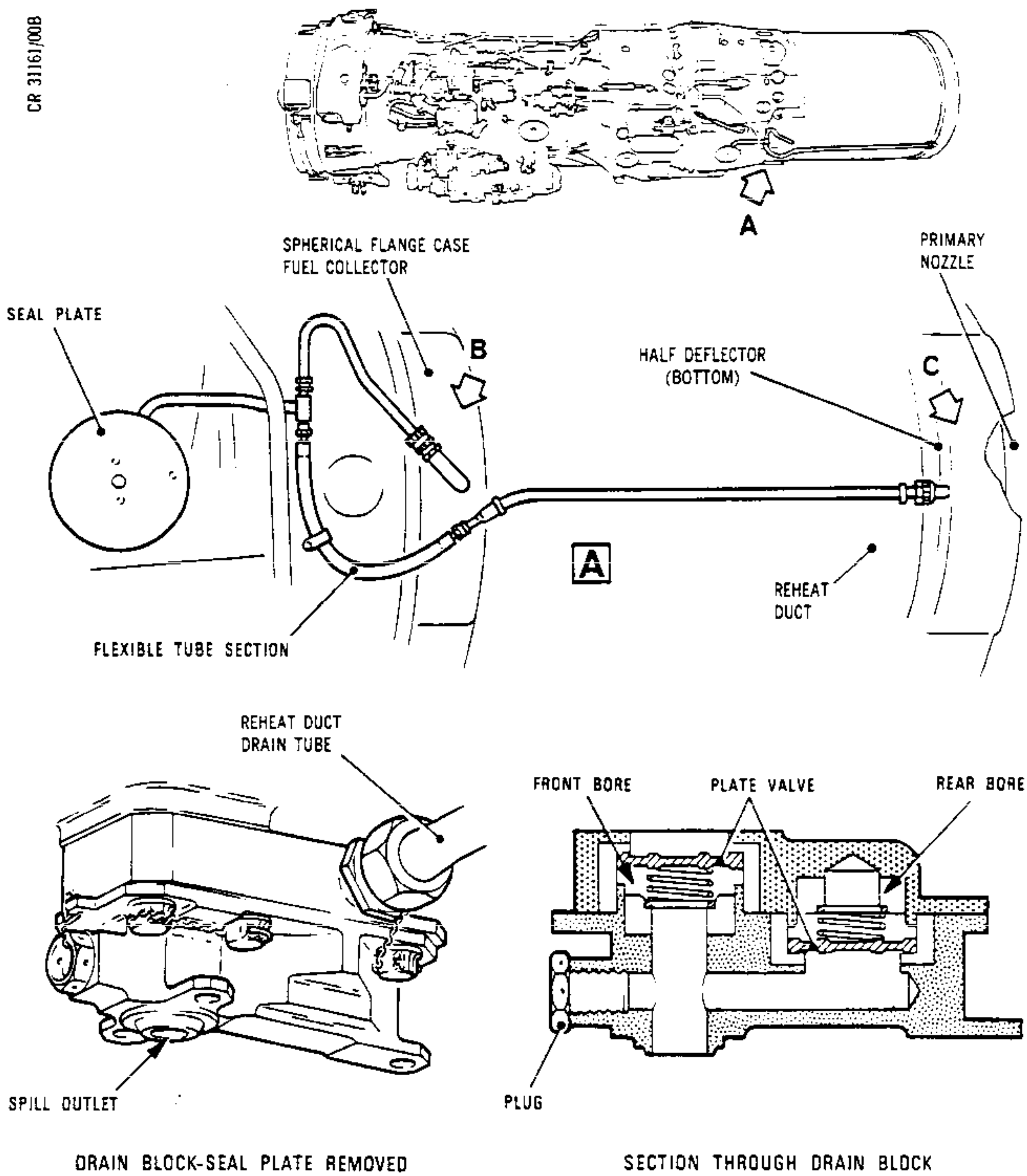
Should a seal fail, fuel will drain from the space between the primary and secondary seals to the external drain connection of the components. From the component connection the drainage will be directed through the flexible and rigid tubes to the connection on the overflow vent at the drains tank and then spill overboard.

9. Operation of the Dump Drain, Gland Drain and Drains Tank

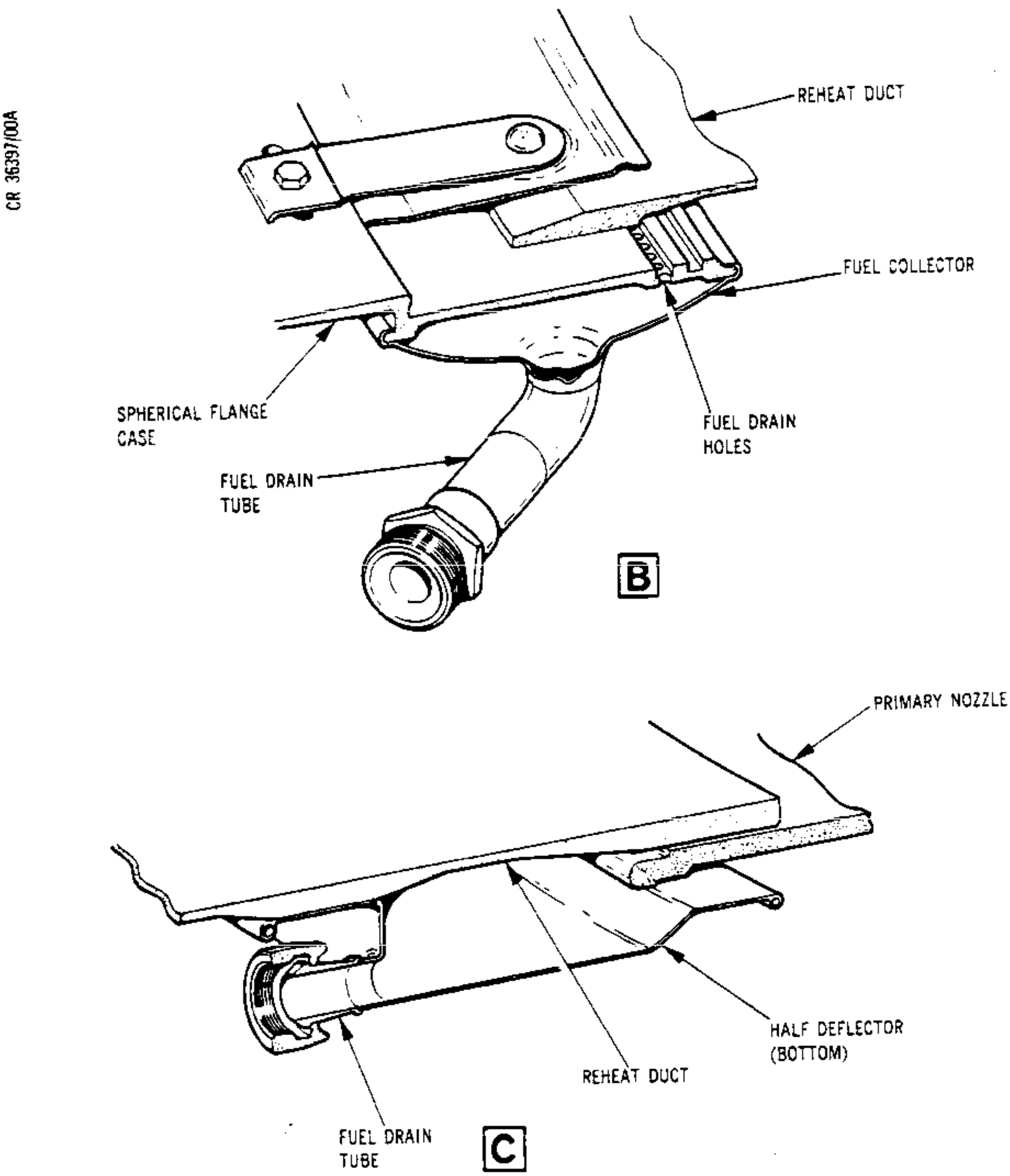
Fuel from the dump valve and emergency dump valve is ducted within the distribution and dump valve to a common outlet and is then directed through the rigid drain tube to the connection on the drains tank and discharged into the tank. The operation of the dump valves are described in 73-10-00.

The gland drains system tubes direct the drainage from the top fuel pumps and FCU to the connection on the fuel/air separator where the fluid enters the swirl chamber.

The action of the fluid in the swirl chamber separates the air and fuel. The air flows through a duct in the roof of the chamber into the drains tank and then passes out to atmosphere via the internal tube and overflow vent. The separated fuel falls into the annular space containing the filter, and passes through the filter and restricted orifice into the drains tank. Fuel, in excess of the flow capacity of the orifice, would accumulate in the annular space and swirl chamber, then overflow into the valve body inlet passage and fill the drainage collection chamber. The excess would then overflow into the valve body vent passage and fall through the exit ports to atmosphere via the overflow vent. Should a sudden build-up of fluid occur in the swirl chamber the action of the fluid against the baffle will bring about rapid dumping of the fluid through the valve body vent passage



Exhaust Diffuser and Reheat Duct Drain System
Figure 006 (Sheet 1 of 2)



Exhaust Diffuser and Reheat Duct Drain System
Figure 006 (Sheet 2 of 2)

to atmosphere. Use of the press-to-test facility will show if any fuel drainage has accumulated in the drainage collection chamber. If fuel is present this is indicative of an excessive leakage rate from a gland seal.

Drainage accumulations in the tank are, under normal engine operating conditions, re-ingested into the aircraft fuel system by the action of an ejector pump in the first stage pump. The ejector pump draws the fluid from the bottom of the tank as described in 73-10-00. A temperature control device in the first stage pump/ejector pump will operate and shut-down the ejector pump under high fuel temperature conditions. Any fuel vaporization in the tank will be vented through the overflow vent passages. Should the drains tank overfill, excess fluid would spill overboard through the overflow vent passages.

During servicing operations a check for excessive gland leakage can be made at the press-to-test valve. Fuel spillage when the valve is unseated indicates possible gland failure. The contents of the drains tank can be drained by removing the drain plug from the bottom of the tank.

R 10. Operation of Exhaust Diffuser and Reheat Duct Drain System
R (Ref. Figs. 006 and 007)

Fuel in the exhaust diffuser case drains through a hole in the bottom of the case and into the drain assembly front bore. Fuel from the front and rear of the reheat duct drains into a fuel collector and the bottom half deflector which in turn directs the fuel through drain tubes to the drain assembly rear bore.

On a static engine, both valves are held in the open position by their springs and fluid can pass down the slots, through the engine drain block to spill into the aircraft drain box. During engine running conditions the valves close. The exhaust diffuser valve is closed when the combination of ambient pressure and spring loading is less than the exhaust diffuser pressure assisted by the valve mass. The jet pipe valve is closed by an ambient pressure greater than the combined engine/jet pipe bay pressure and spring loading plus the valve mass.

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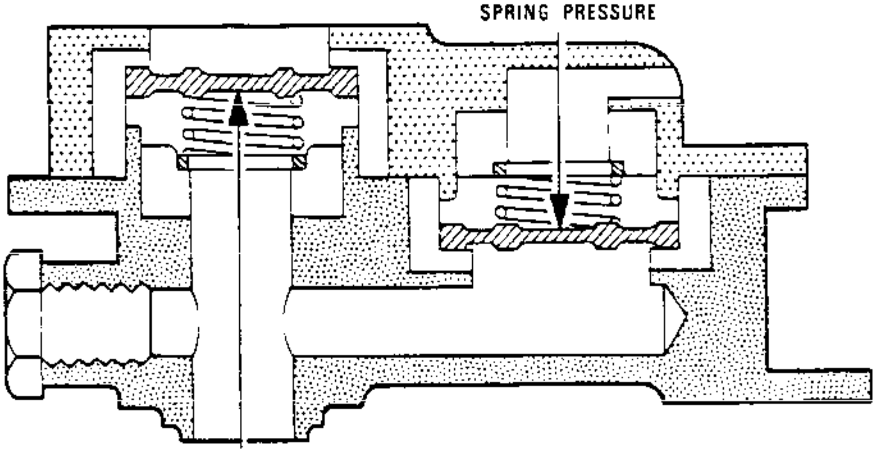
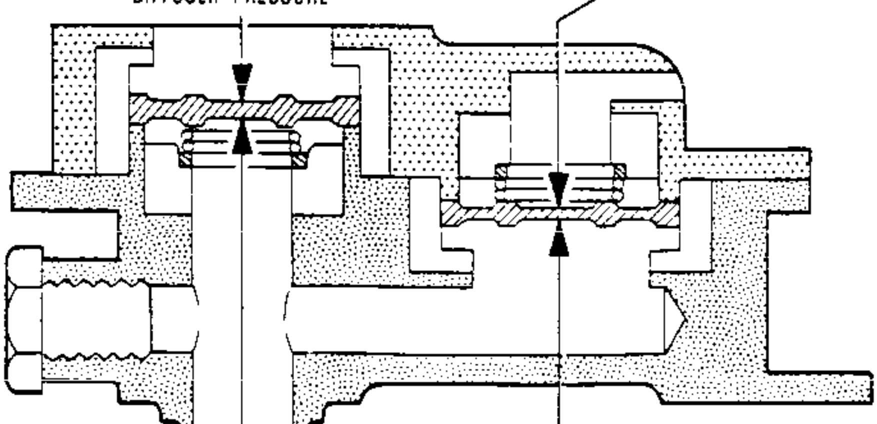


VALVES OPEN



VALVES CLOSED

R Exhaust Diffuser and Reheat Duct Drain Block Operation
Figure 007

DRAINS TANK - SERVICING

1. General

Provision is made for draining the fuel drains tank should it become filled during servicing operations.

2. Draining

A. Prepare for Draining.

(1) Open engine bay rear lower door (Ref.71-00-00, Servicing).

(2) Position container below tank drain plug.

B. Drain Tank (Ref. Fig. 301)

(1) Unscrew plug and allow fuel to drain into container.

(2) On completion of draining install drain plug.

(a) Assemble a new sealing washer to plug.

(b) Apply lubricant B (Ref.70-00-01, Servicing and Storage Materials) to plug.

(c) Assemble plug to tank and torque-tighten to
R between 230 and 250 lbf in. (26 and 28 N.m).

(d) Wire-lock plug to flange on tank connection.

C. Complete the Procedure.

(1) Close engine bay door (Ref.71-00-00, Servicing).

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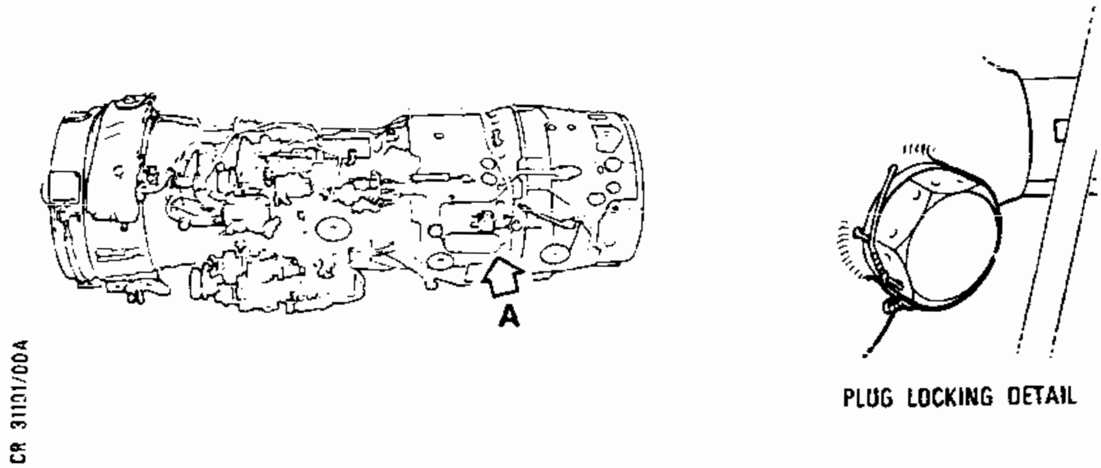
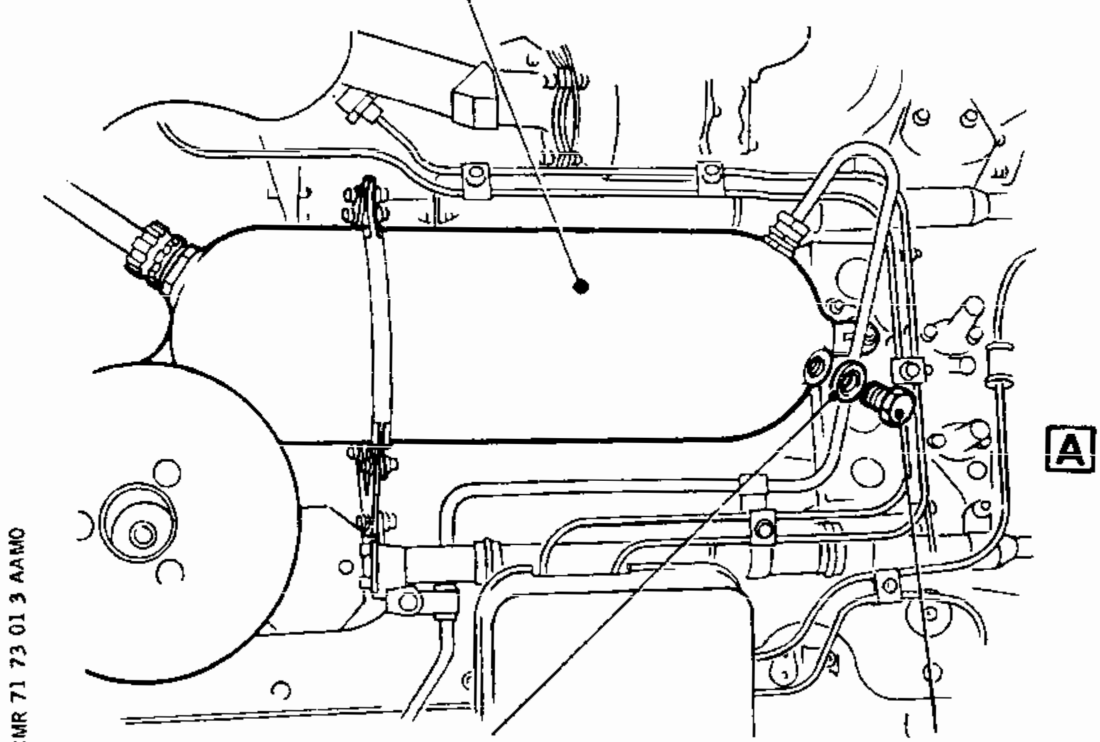




Draining Fuel Drains Tank
Figure 301

DRAINS TANK - REMOVAL/INSTALLATION

1. General

This chapter details the removal and installation procedures for the drains tank in paragraph 2, the overflow vent,valve body and filter in paragraph 3, and the press-to-test valve facility in paragraph 4. The following procedures apply to
R S.B.OL.593-71-8 and pre and S.B.OL-593-72-115 standard engines.

Details of approved servicing and storage materials quoted in this chapter are given in 70-00-01.

2. Drains Tank (Ref. Fig. 401)

A. Prepare to Remove Drains Tank.

(1) Open engine bay rear lower door (Ref.71-00-00, Servicing).

(2) Remove drain plug from tank and drain fuel into a container. Apply lubricant B to drain plug, place a new seal washer in position, install plug in tank and lightly tighten. Discard drained fuel.

B. Remove Drains Tank.

(1) Remove nuts and eccentric bolts securing sealing plate to overflow vent and remove sealing plate together with sleeve.

(2) Disconnect tubes from the following locations.

(a) The seal failure drains system tubes at multiple connector on overflow vent.

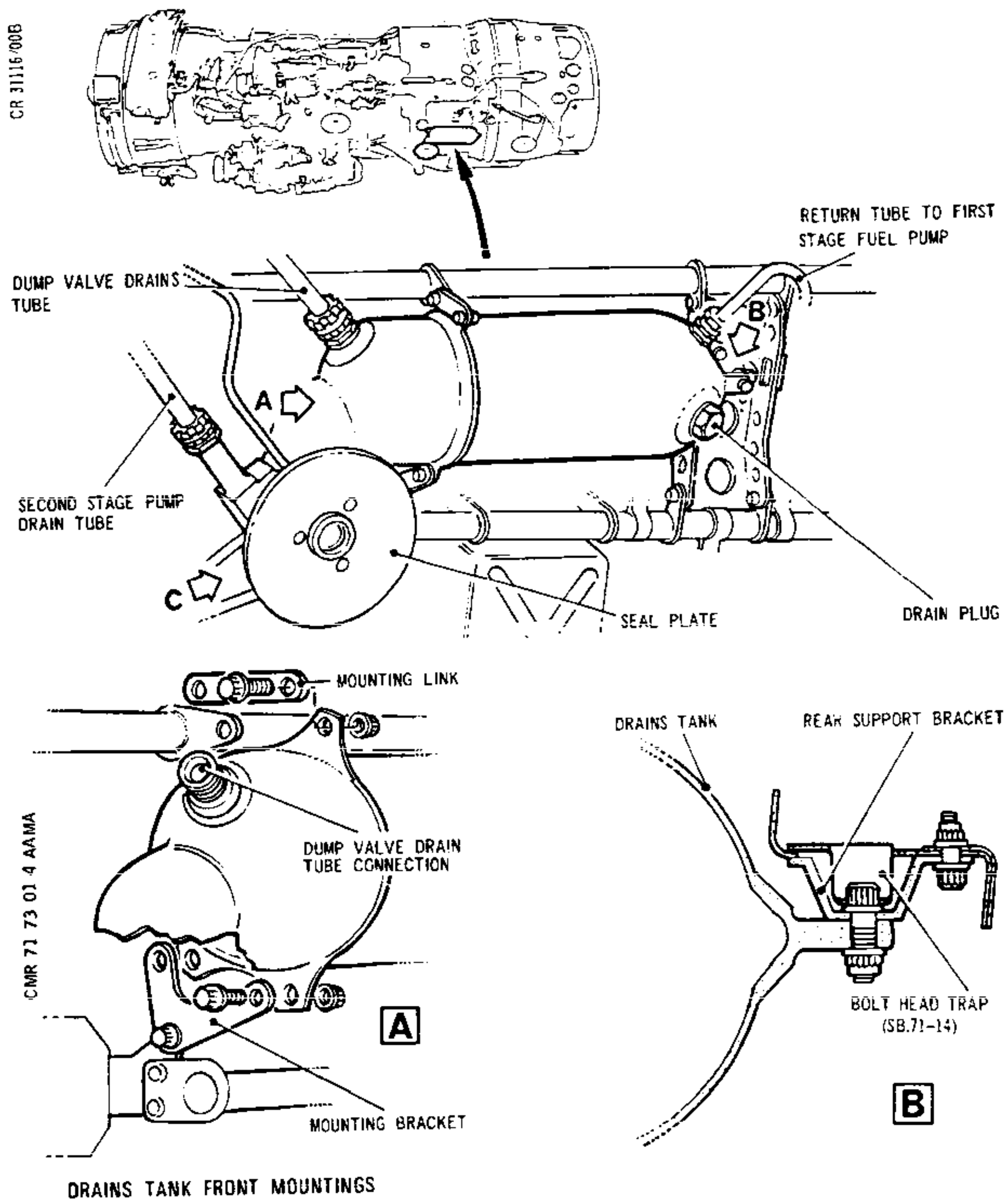
(b) The IDG rupture valve drain tube and the second stage pump drain tube at their connections on the overflow vent.

(c) The dump valve drain tube at connection on tank.

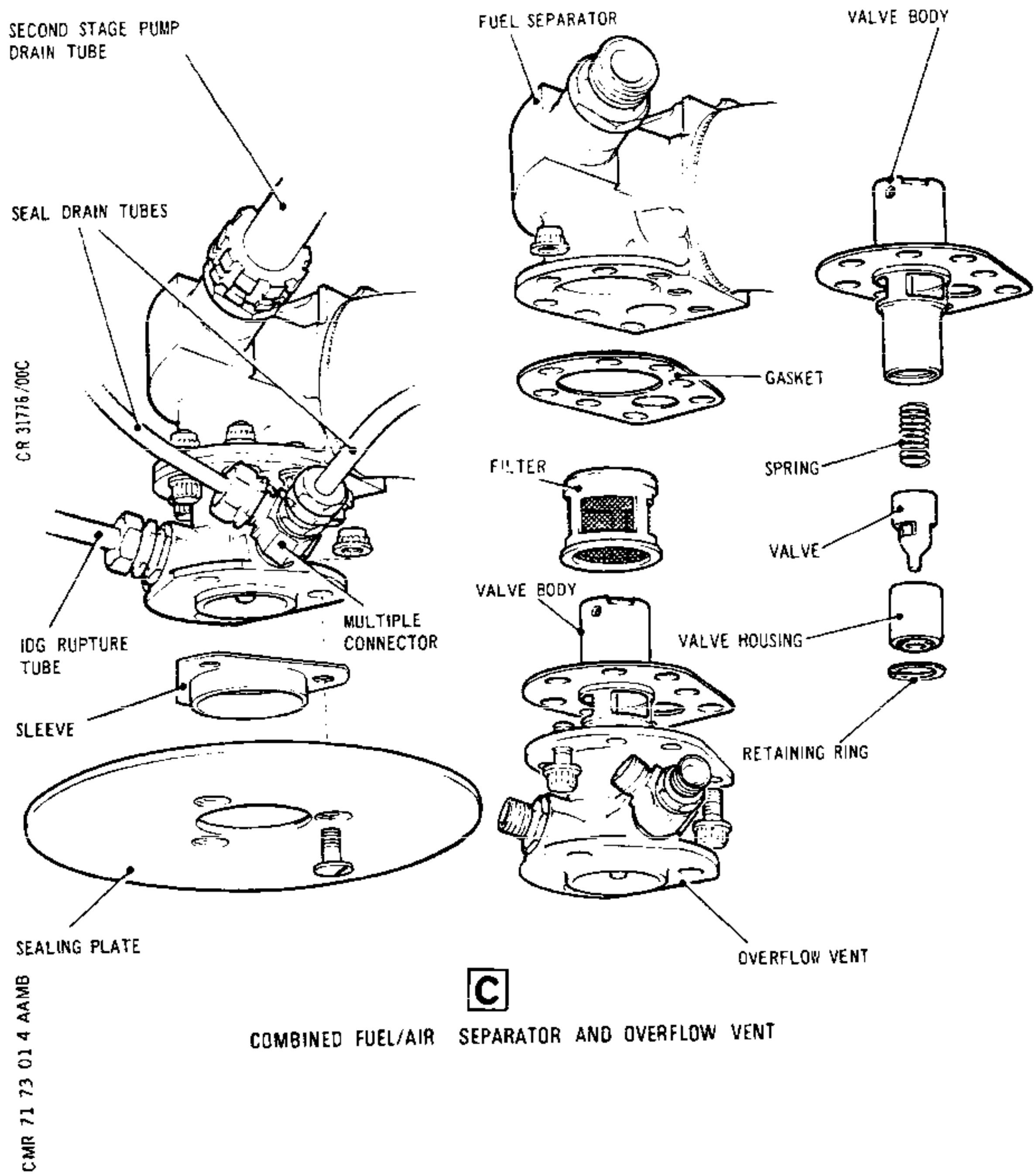
(d) The return tube to first stage fuel pump at connection on tank.

(3) Detach and remove tank.

(a) Remove nut and bolt securing mounting link to tank left-hand side.



Drains Tank - Overflow Vent Installation
Details (Sheet 1 of 2)
Figure 401



Drains Tank - Overflow Vent Installation
Details (Sheet 2 of 2)
Figure 401

(b) Support tank and remove nuts and bolts securing mounting bracket to tank right-hand side.

(c) On engines to Pre.S.B.OL.593-71-14 standard, remove three nuts and bolts securing the rear support bracket to the engine mounted bracket, then remove the tank from engine.

(d) On engines to S.B.OL.593-71-14 standard, remove nut securing drains tank to rear support bracket, then remove tank from engine.

(4) If the tank is to be renewed, remove the following components ready for assembly to the new tank as detailed in paragraph C.(1).

(a) Remove the three setbolts and five nuts and bolts securing the overflow vent to the fuel/air separator and remove the overflow vent complete with valve body, gasket and filter.

(b) Remove the drain plug.

(c) On engines to Pre.S.B.OL.593-71-14 standard, remove nut and bolt securing the rear support bracket to the tank and remove the bracket.

C. Install Drains Tank.

(1) Prepare a new tank for installation.

(a) Apply lubricant B to attachment items.

(b) Secure the overflow vent complete with valve body, new gasket and filter to the fuel/air separator with three setbolts and five nuts and bolts torque-tightened to between 85 and 95 lbf in. (9,6 and 10,7 N.m). Wire-lock the three setbolts.

(c) Install the drain plug and new seal washer, lightly tighten.

NOTE: Torque-tighten to between 230 and 250 lbf in. (26 and 28 N.m) and wire-lock the plug when the tank has been installed to the engine.

(d) On engines to Pre.S.B.OL.593-71-14 standard, secure the rear support bracket to the tank with the nut and bolt torque-tightened to

between 85 and 95 lbf in. (9,6 and 10,7 N.m). Ensure that the three mounting holes in the rear support bracket will align with the corresponding holes in the engine mounted bracket.

(2) Support tank in position and attach to mountings.

(a) Apply lubricant B to attachment items.

(b) Locate tank on engine and support in position.

(c) Secure tank to left-hand mounting link with a nut and bolt lightly tightened.

(d) Secure tank to right-hand mounting bracket with two nuts and bolts lightly tightened.

(e) On engines to Pre S.B.OL.593-71-14 standard, secure tank rear support bracket to engine mounted bracket with three nuts and bolts torque-tightened to between 36 and 40 lbf in. (4,1 and 4,5 N.m).

(f) On engine to S.B.OL.593-71-14 standard,secure tank to the bolt located in the rear support bracket with a nut torque-tightened to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

(g) Torque-tighten nuts and bolts at left-hand and right-hand mountings to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

(3) Connect tubes at the following locations.

(a) Connect second stage pump drain tube to overflow vent with union nut torque-tightened to between 600 and 660 lbf in. (68 and 74 N.m) with lubricant B applied.

R (b) Apply lubricant A to remaining tube union connections.

(c) Connect IDG rupture valve drain tube to overflow vent and torque-tighten union nut to between 280 and 310 lbf in. (32 and 35 N.m).

(d) Connect two seal failure drains system tubes to multiple connector on overflow vent and torque-tighten each union nut to between 190 and 210 lbf in. (21,5 and 23,5 N.m).

(e) Connect dump valve drain tube to tank connection and torque-tighten union nut to between 310 and 340 lbf in. (35 and 38 N.m).

(f) Connect return tube drains tank to first stage pump to tank connection and torque-tighten union nut to between 190 and 210 lbf in. (21,5 and 23,5 N.m).

(g) Wire-lock all the union nuts.

(4) Torque-tighten drain plug to between 230 and 250 lbf in. (26 and 28 N.m) and wire-lock it.

(5) Apply lubricant B and secure sealing plate and sleeve on overflow vent with three eccentric bolts and nuts torque-tightened to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

(6) Close engine bay rear lower door.

3. Overflow Vent, Valve Body and Filter (Ref. Fig. 401)

A. Prepare to Remove Overflow Vent, Valve Body and Filter.

(1) Open engine bay rear lower door (Ref.71-00-00, Servicing).

B. Remove Overflow Vent, Valve Body and Filter.

(1) Remove nuts and eccentric bolts securing sealing plate to overflow vent and remove sealing plate together with sleeve.

(2) Disconnect tubes from the following locations.

(a) The seal failure drains system tubes at multiple connector on overflow vent.

(b) The IDG rupture valve drain tube.

(3) Remove nuts and bolts securing the overflow vent to the fuel/air separator and remove the overflow vent complete with valve body, gasket and filter.

(4) Remove filter and gasket and withdraw valve body from overflow vent.

(5) If required, remove press-to-test valve from valve body as detailed in paragraph 4.B.

C. Install Overflow Vent, Valve Body and Filter
(Ref. Fig. 401)(Detail C).

(1) If removed, install press-to-test valve in valve body as detailed in paragraph 4.C.

(2) Assemble valve body, gasket and filter to overflow vent.

(a) Locate valve body in overflow vent, position a new gasket on valve body and align bolt-holes.

(b) Install filter on valve body with flange end on gasket.

(3) Secure overflow vent to fuel/air separator.

(a) Apply lubricant B to attachment items.

(b) Secure overflow vent to fuel/air separator with three setbolts and five nuts and bolts torque-tightened to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

(c) Wire-lock the three setbolts.

(4) Connect drains tubes to union connections.

(a) Apply lubricant A to tube union connections.

(b) Connect two seal failure drains system tubes to multiple connector on overflow vent and torque-tighten each union nut to between 190 and 210 lbf in. (21,5 and 23,5 N.m).

(c) Connect IDG rupture valve drain tube to overflow vent and torque-tighten union nut to between 280 and 310 lbf in. (32 and 35 N.m).

(d) Wire-lock all union nuts.

(5) Apply lubricant B and secure sealing plate and sleeve on overflow vent with three eccentric bolts and nuts torque-tightened to between 85 and 95 lbf in. (9,6 and 10,7 N.m.).

R NOTE: Eccentric headed bolts to S.B.OL593-72-115
R standard have a slotted head.

(6) Close engine bay rear lower door (Ref.71-00-00, Servicing).

4. Press-to-Test Valve

A. Prepare to Remove Press-to-Test Valve.

(1) Open engine bay rear lower door (Ref.71-00-00, Servicing).

B. Remove Press-to-Test Valve.

(1) Depress valve housing against spring and remove retaining ring.

(2) Carefully remove valve housing, complete with press-to-test valve and helical spring.

(3) Remove helical spring and press-to-test valve from valve housing.

C. Install Press-to-Test Valve.

(1) Assemble press-to-test valve and helical spring in valve housing.

(2) Locate valve housing in valve body, depress housing against spring and retain in position with the retaining ring.

D. Complete the Procedure.

(1) Close engine bay rear lower door (Ref.71-00-00, Servicing).

TUBES - COMPONENT CONNECTIONS TO OVERBOARD SPILL - REMOVAL/INSTALLATION

1. General

The flexible tubes connect finally to two rigid tubes. General removal procedures for the two types of tube are given in paragraph B while the installation procedures are given separately in paragraphs C and D. Connector removal and installation procedures are detailed in paragraph E. The location and installation details of the supporting clamp assemblies are shown in the illustration (Ref. Fig. 401).

R Thrust wire type union nuts require triple torque-tightening
R to ensure correct seating. This procedure involves torque-
R tightening and slackening the nut twice prior to final torque-
R tightening.

2. Tubes - Component Connections to Overboard Spill (Ref. Fig. 401).

A. Prepare to Remove Tube.

(1) On engines No. 1 and No. 3 - open engine bay front and rear doors (Ref. 71-00-00, Servicing).

(2) On engines No.2 and No.4 - open engine bay front and rear lower doors.

B. Remove Flexible and Rigid Tubes

(1) Detach supporting clamp assemblies.

(2) Unscrew union nuts and remove tube.

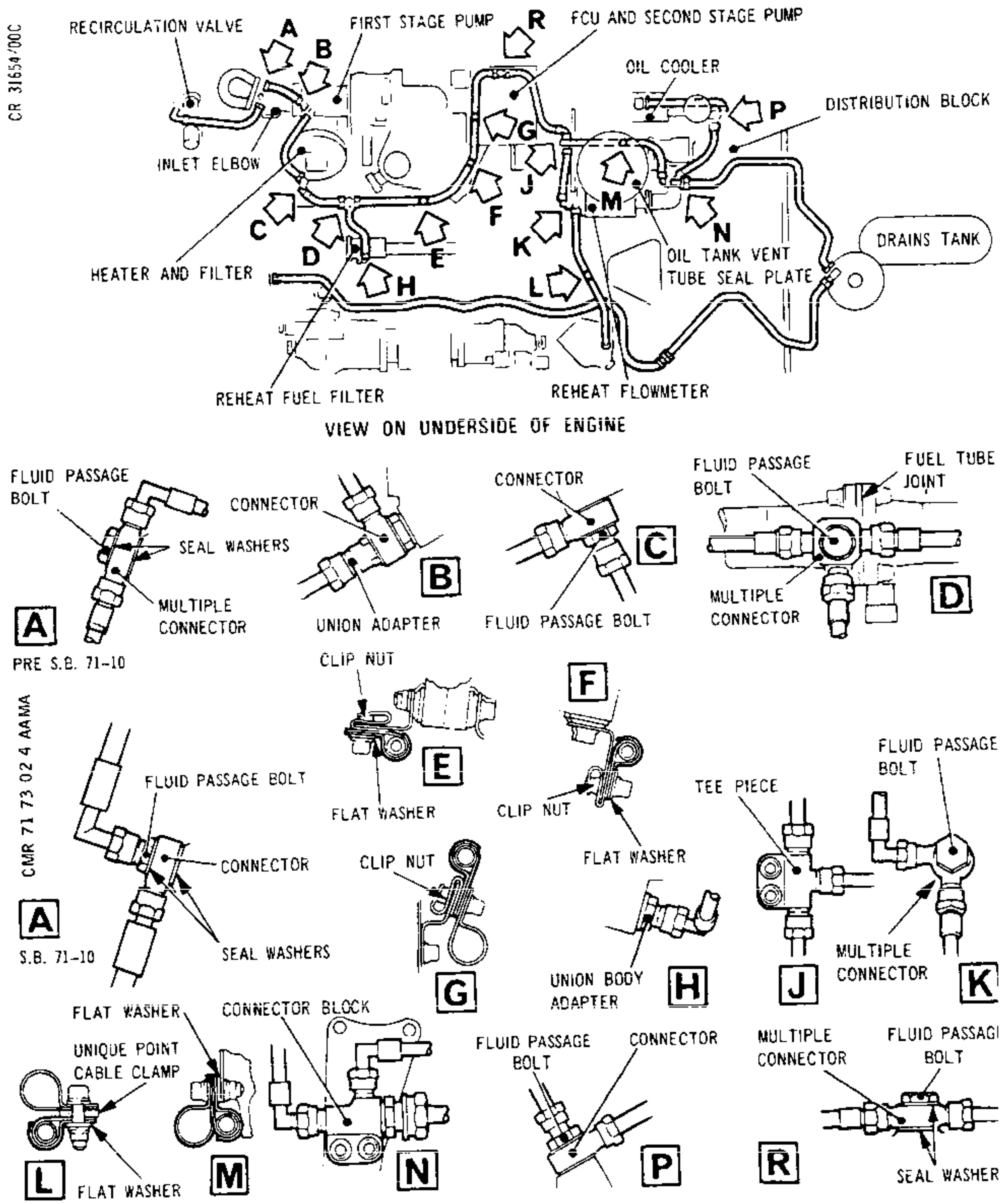
C. Install Flexible Tubes.

(1) Apply lubricant B (Ref. 70-00-01, Servicing and Storage Materials) to clamp assembly items, lubricant A to tube connections.

(2) Position tubes and screw on union nuts hand-tight.

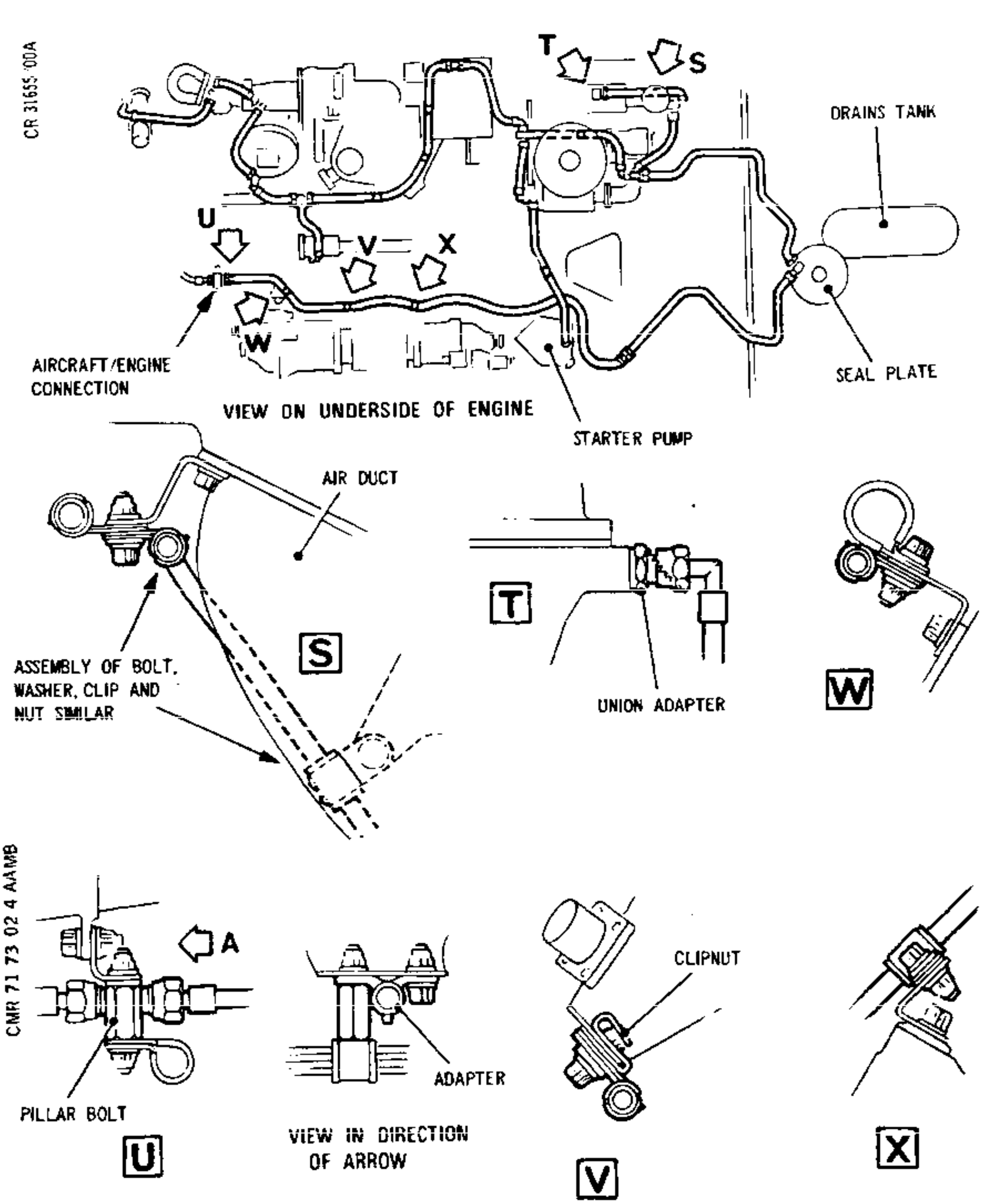
(3) Secure tube supporting clamp assemblies. Ensure that attachment items are correctly positioned and secure with a bolt and nut or clipnut torque-tightened to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

(4) Torque-tighten union nuts securing flexible tubes to union connectors to between 90 and 100 lbf in. (10,2

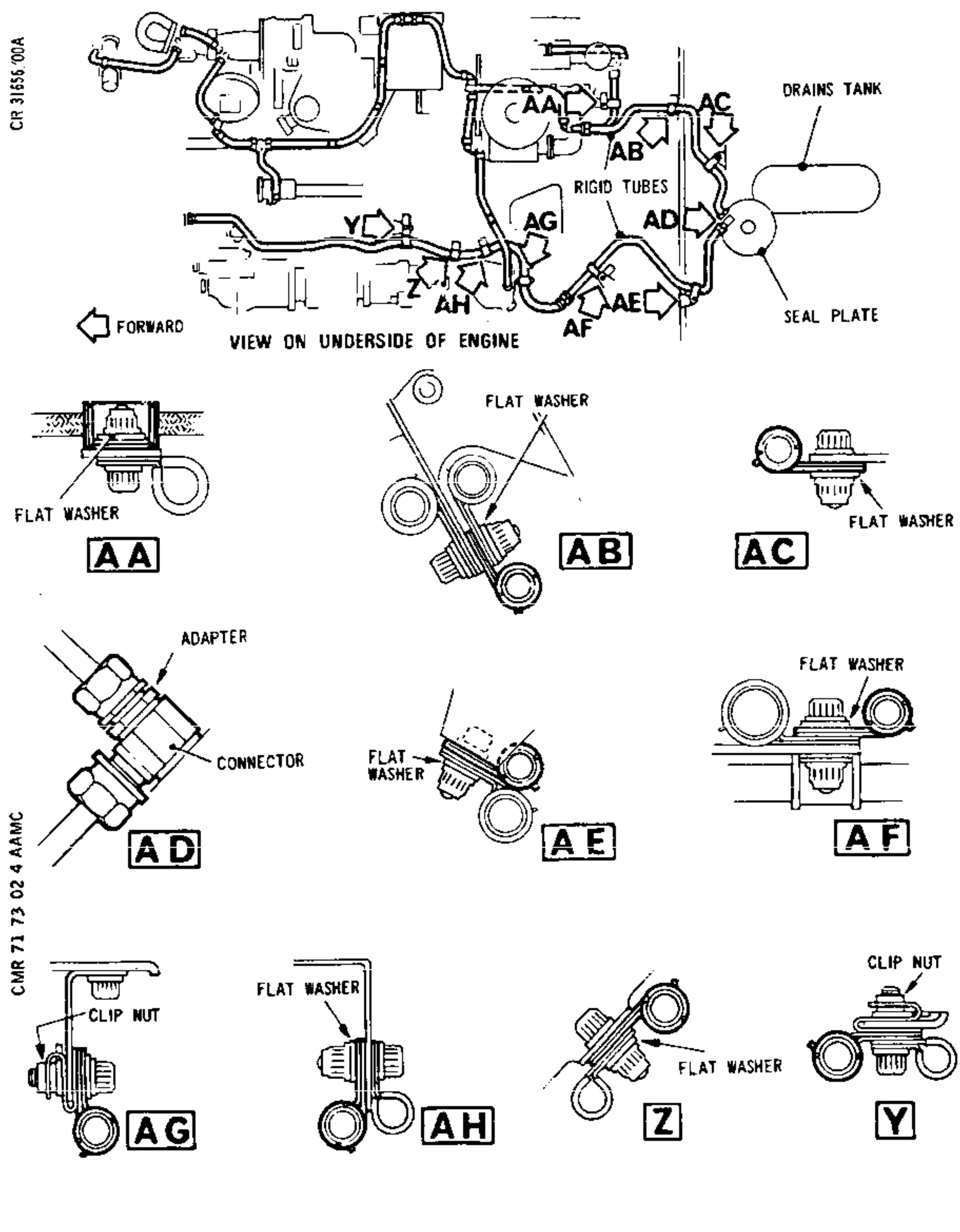


Seal Failure Drains System Connection and
Clipping Details (Sheet 1 of 3)
Figure 401

R



Seal Failure Drains System Connection and Clipping Details (Sheet 2 of 3)
Figure 401



Seal Failure Drains System Connection and
Clipping Details (Sheet 3 of 3)
Figure 401

and 11,3 N.m). Thrust wire type union nuts must be triple torque-tightened (Ref.70-00-04).

(5) Wire-lock union nuts.

D. Install Rigid Tubes.

(1) Apply lubricant A (Ref.70-00-01, Servicing and Storage Materials) to union nuts and overboard drains connections.

(2) Torque-tighten union connections at positions N and AD (Ref. Fig. 401) to between 190 and 210 lbf in. (21,5 and 23,5 N.m).

(3) Torque-tighten union connection, flexible tube to rigid tube to between 90 and 100 lbf in. (10,2 and 11,3 N.m). A thrust wire type union nut must be triple torque-tightened (Ref.70-00-04).

(4) Wire-lock union connections.

(5) Assemble clamp assemblies and torque-tighten to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

E. Connector Removal/Installation

NOTE: Connector at position AD is retained by an adapter Ref. para. (3) and (4).

(1) Remove connector.

(a) Unscrew tube union nuts.

(b) Unscrew fluid passage bolt and remove connector.

(2) Install connector.

(a) Apply lubricant A (Ref.70-00-01, Servicing and Storage Materials) to fluid passage bolt and tube union nuts.

(b) Install connector with a new seal washer on each side and secure with a fluid passage bolt.

(c) Torque-tighten fluid passage bolt to between 150 and 170 lbf in.(16,9 and 19,2 N.m).

(d) Connect tube union nuts and torque-tighten to between 90 and 100 lbf in. (10.2 and 11,3 N.m). Thrust wire type union nuts must be

R triple torque-tightened (Ref.70-00-04).

R (e) Wire-lock union connections.

R (3) Remove connector at position AD.

R (a) Unscrew tube union nuts from connector.

R (b) Unscrew adapter and remove connector.

R (4) Install connector at position AD.

R (a) Apply lubricant A (Ref.70-00-01, Servicing and
R Storage Materials) to adapter and tube union
R nuts.

R (b) Install connector with a new seal washer on each
R side and, with connector in alignment with
R connecting tube union nuts, secure with adapter.

R (c) Torque-tighten adapter to between 240 and 260
R lbf in. (27 and 29,4 N.m).

R (d) Connect tube union nuts to connector and torque-
R tighten to between 190 and 210 lbf in. (21,5 and
R 23,5 N.m).

R (e) Wire-lock union connections.

F. Complete the Installation

(1) On engines No.1 and No.3 - close engine bay front and rear doors (Ref. 71-00-00, Servicing).

(2) On engines No. 2 and No.4 - Close engine bay front and rear lower doors.

TUBE, SECOND STAGE PUMP TO DRAINS TANK - REMOVAL/INSTALLATION

1. Tube, Second Stage Pump to Drains Tank (Ref. Fig. 401)

   A. Prepare to Remove Tube.

      (1) Open engine bay front and rear lower doors (Ref.71-00-00, Servicing).

   B. Remove Tube.

      (1) Unscrew union nut securing tube to second stage pump elbow.

      (2) Unscrew union nut from drains tank connection.

      (3) Detach supporting clamp assembly, disengage tube and withdraw it from the engine.

      (4) If tube is to be renewed, transfer clamp assembly to the tube to be installed.

   C. Install Tube.

R R R (1) Apply lubricant A (Ref.71-00-00, Servicing and Storage Materials) to union nuts and lubricant B to clamp assembly items.

      (2) Hold tube in position on engine.

      (3) Secure tube to second stage pump elbow with union nut hand tight.

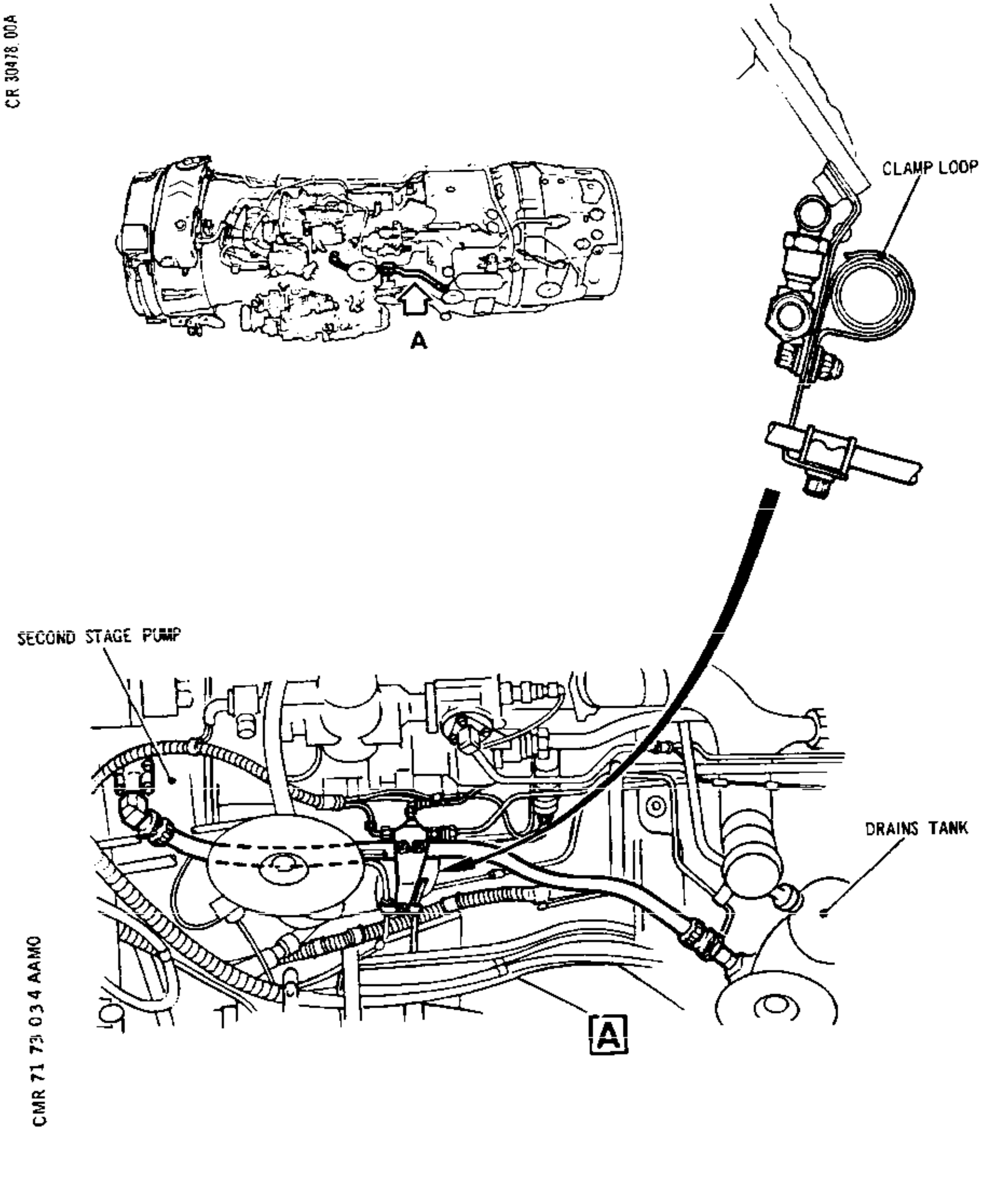
      (4) Secure tube to drains tank connection with union nut hand tight.

      (5) Attach clamp assembly to support bracket with bolt, flat washer and nut torque-tightened to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

      (6) Torque-tighten union nuts to between 600 and 660 lbf in. (68 and 74 N.m). Wire-lock each nut.

   D. Complete the Installation.

      (1) Close engine bay front and rear lower doors (Ref.71-00-00, Servicing).



Second Stage Pump Gland Drains to Tank
Figure 401

TUBE - FIRST STAGE PUMP AND FCU TO CONNECTION ON SECOND STAGE PUMP - REMOVAL/INSTALLATION

1. Tools and Equipment

   Circuit breaker safety clip ... ... -

2. Tube - First Stage Pump and FCU to Connection on Pump (Ref. Fig. 401)

   A. Prepare to Remove Tube.

      (1) Open engine bay front doors (Ref.71-00-00,Servicing).

      (2) Electrically isolate the engine additional services indicated in Table 401 by tripping the circuit breakers affecting the engine upon which work is to be carried out. Attach safety clips.

      (3) Disconnect electrical lead end plugs from the two receptacles on the throttle valve actuator gearbox.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Engine No.1			
Throttle Cont.	2-213	1K1	F12
	3-213	1K3	A1
	14-215	1K2	G12
	15-216	1K4	E8
Engine No.2			
Throttle Cont.	1-213	2K3	A3
	2-213	2K1	C12
	13-215	2K2	F14
	15-215	2K4	F15
Engine No.3			
Throttle Cont.	1-213	3K3	A4
	2-213	3K1	C13
	13-216	3K2	C5
	15-215	3K4	F16
Engine No.4			
Throttle Cont.	2-213	4K1	F13
	3-213	4K3	A2

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
	14-216	4K2	C7
	15-216	4K4	F9

Circuit Breakers
Table 401

B. Remove Tube.

(1) Remove fluid passage bolt securing tube connector to first stage pump.

(2) Detach supporting clamp assembly.

(3) Unscrew union nut at FCU end of tube.

(4) Unscrew union nut at fuel drain to tank tube. Remove tube from engine.

C. Install Tube.

(1) Apply lubricant A (Ref.70-00-01, Servicing and Storage Materials) to assembly items.

(2) Position tube on engine and engage union nuts hand-tight.

(3) Align connector to first stage pump with a new seal washer on each side and secure with fluid passage bolt.

(4) Secure clamp assembly to pump casing bracket with bolt, flat washer and nut torque-tightened to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

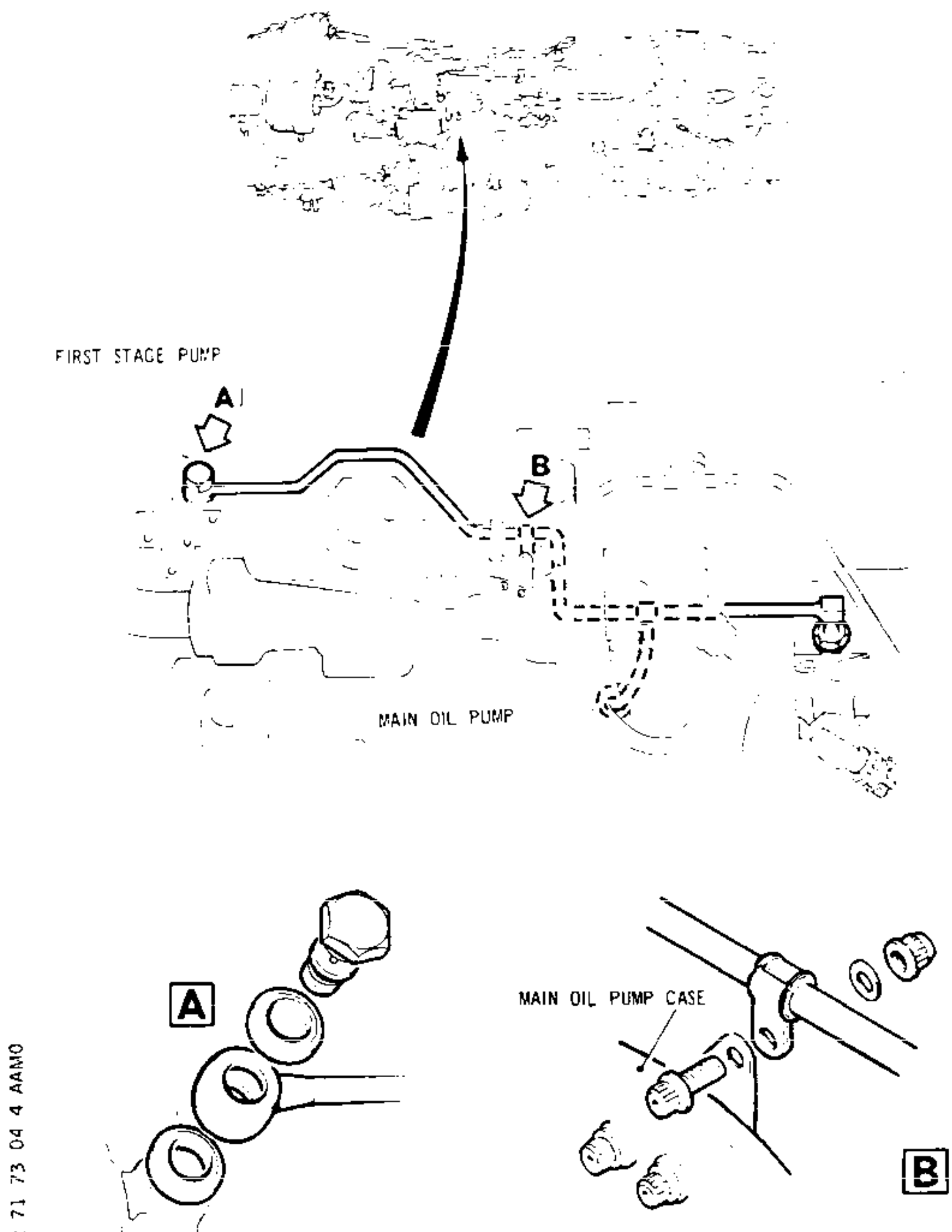
(5) Torque-tighten fluid passage bolt to between 210 and 230 lbf in. (24 and 26 N.m).

(6) Torque-tighten union connections at FCU and fuel drain tube to between 190 and 210 lbf in. (21,5 and 23,5 N.m).

(7) Wire-lock union connections.

D. Complete the Installation.

(1) Connect and tighten electrical lead end plugs to



Tube Section and Location Details
Figure 401

their respective throttle valve actuator gearbox receptacles.

(2) Close engine bay front doors (Ref.71-00-00, Servicing).

(3) Remove safety clips and reset remaining circuit breakers (Ref.Table 401).

TUBE, DISTRIBUTION AND DUMP VALVE TO DRAINS TANK - REMOVAL/INSTALLATION

1. Tube-Distribution to Drains Tank (Ref. Fig. 401)

   A. Prepare to Remove Tube.

      (1) Open engine bay front and rear lower doors (Ref. 71-00-00, Servicing).

   B. Remove Drain Tube.

      (1) Drain fuel from drains tank.

      (2) Detach tube support clamp assembly and electrical cable clamp from bracket, at diffuser case flange.

      (3) Remove three bolts securing tube flange to distribution and dump valve and release bracket. Do not disturb adjacent bolts.

      (4) Support tube and unscrew union nut from drains tank connection.

      (5) Disengage tube spigot from distribution and dump valve dump outlet and remove tube from engine.

      (6) If tube is to be renewed, transfer clamp assembly to similar position on the tube to be installed.

   C. Install Drain Tube.

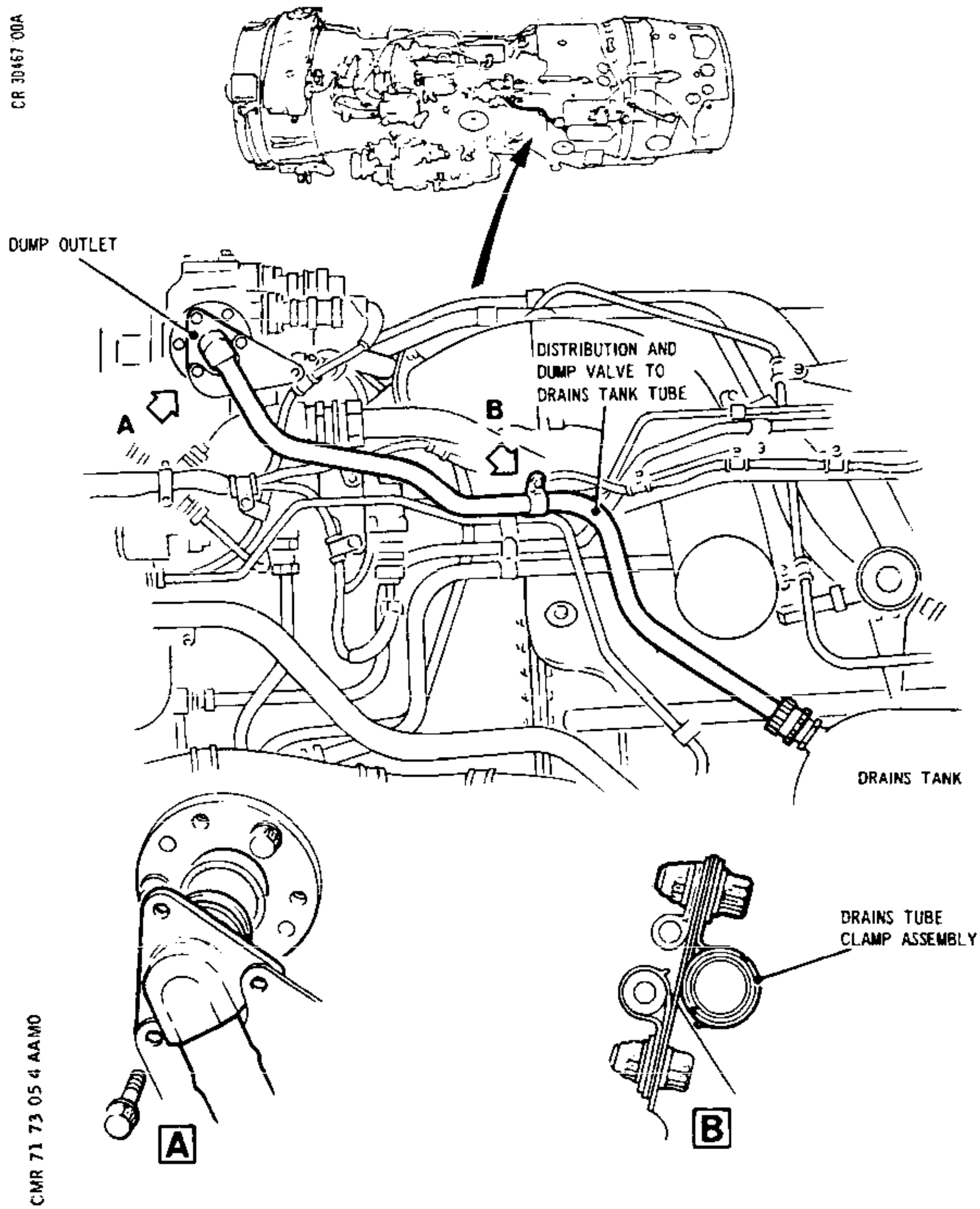
      (1) Apply lubricant A (Ref. 70-00-01, Servicing and Storage Materials) to tube union nut and attachment bolts.

      (2) Assemble a new sealing ring to the spigot groove of attachment flange.

      (3) Engage tube spigot squarely with dump outlet of distribution and dump valve and union nut with drains tank union and hold in position (Ref.Fig. 401).

R R R NOTE: If difficulty is experienced in assembling and securing elbow to distribution and dump valve refer to S.B.OL.593-71-8482-20.

      (4) Screw union nut on hand-tight and retain flange and bracket to distribution and dump valve with the



Drain Tube Attachment Details
Figure 401

three bolts lightly tightened. Locate the two longer bolts to retain the associated bracket.

(5) Torque-tighten tube flange retaining bolts to between 85 and 95 lbf in. (9,6 and 10,7 N.m) and union nut to between 310 and 340 lbf in. (35 and 38 N.m).

(6) Wire-lock union nut.

(7) Apply lubricant A to attachment items, secure tube clamp assembly and electrical cable clamp to bracket at diffuser case flange with clamp assembly, bolt, washer, and nut. Torque-tighten nut to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

D. Complete the Installation.

(1) Close engine bay front and rear lower doors (Ref. 71-00-00, Servicing).

ENGINE DRAIN ASSEMBLY AT EXHAUST DIFFUSER CASE - REMOVAL/INSTALLATION

1. General

Fuel drainage from the exhaust diffuser and reheat chamber is drained to atmosphere via the drain assembly.

The following procedures apply to pre and S.B.OL.593-72-115 standard engines.

2. Engine Drain Assembly (Ref. Fig.401)

A. Prepare to Remove Drain Assembly.

(1) Open engine bay rear lower door (Ref.71-00-00, Servicing).

B. Remove Drain Assembly.

(1) Remove nuts and eccentric head bolts and detach sealing plate, sleeve and packing piece from drain body.

(2) Unscrew drain tube union nut from drain assembly.

CAUTION: DO NOT REMOVE TWO NUTS AND BOLTS THAT SECURE UPPER AND LOWER DRAIN BODIES TOGETHER.

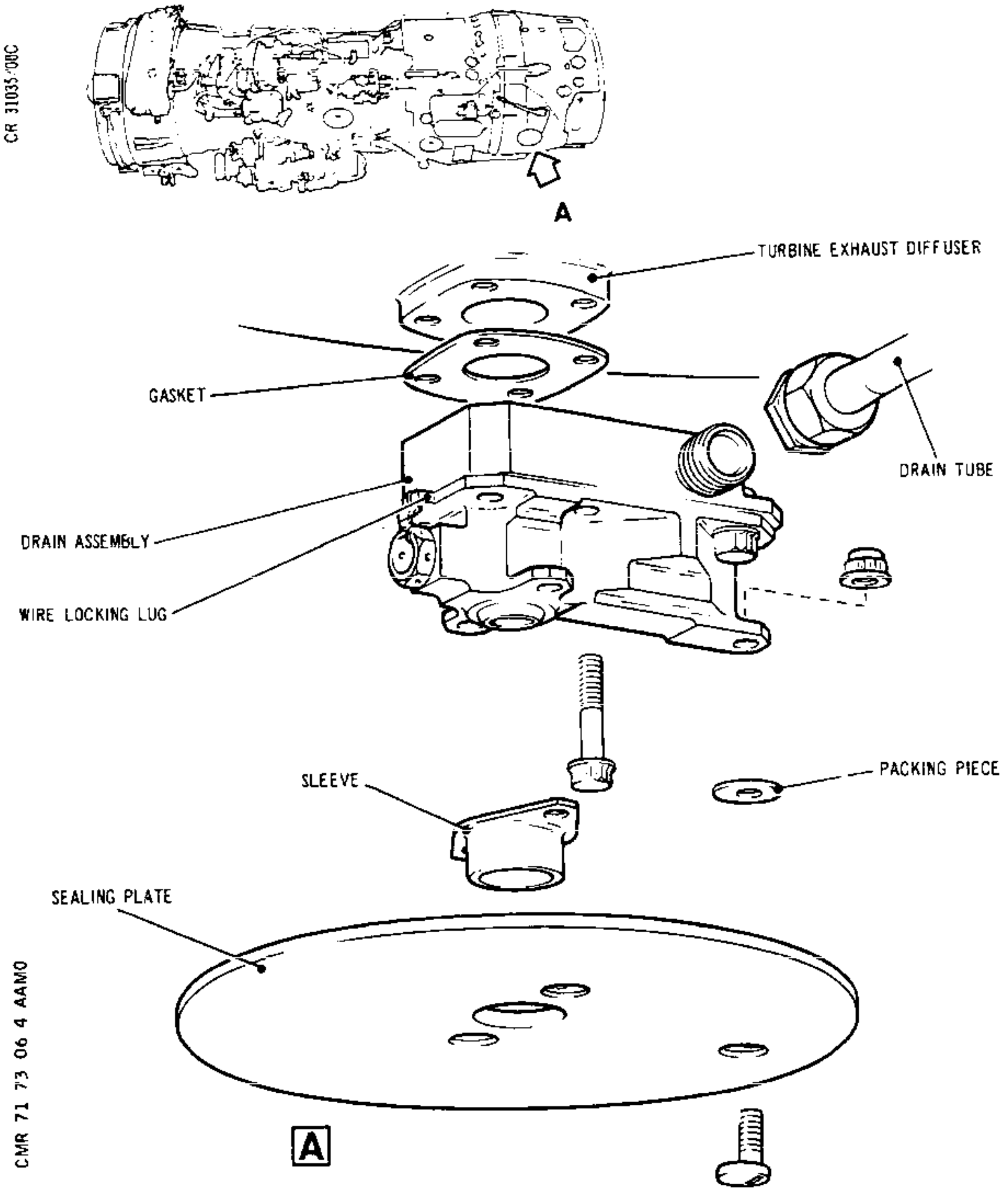
(3) Remove the four bolts securing assembly to exhaust diffuser case and remove drain assembly from engine.

C. Install Drain Assembly.

R CAUTION: IT IS ESSENTIAL THAT LUBRICANT 'C' IS USED
R ON THE APPLICABLE BOLTS/NUTS DURING
R ASSEMBLY (REF. SB.OL.593-72-9044-436).

(1) Apply lubricant B (Ref.70-00-01, Servicing and Storage Materials) to tube union connection. Apply lubricant C to attachment nuts and bolts.

(2) Position assembly on exhaust diffuser case with new gasket between mating faces and secure with four bolts, torque-tightened to 100 lbf in (11,5 Nm). If there is no wire locking lug for blanking plug, assemble wire locking plate to S.B.OL.593-71-8494-27 standard to bolt nearest plug. Wire-lock bolts in pairs and wire-lock plug to locking plate if no wire locking lug available.



Engine Drain Assembly
Figure 401

R

(3) Connect drain tube union nut to assembly and torque-tighten to between 160 and 180 lbf in (18,1 and 20,3 Nm). Wire-lock union nut.

(4) Position sleeve and packing piece on bottom surface of sealing plate and position assembly on drain valve, secure with three eccentric bolts and nuts torque-tightened to 135 lbf in (15,2 Nm). Locking (Run-down) torque to 3,5 lbf in (0,4 Nm).

<u>NOTE:</u> Eccentric headed bolts to S.B. OL.593-72-115 standard have a slotted head.

D. Complete the Procedures.

(1) Close engine bay door (Ref.71-00-00, Servicing).

OIL DRAINS - DESCRIPTION AND OPERATION

1. General (Ref. Fig.001 and 002)

   Rigid tubes form separate enclosed drain systems to direct drain oil from the integrated drive generator (IDG), hydraulic pumps and air starter to overboard spill connections.

2. Tubes, IDG Cooler Rupture Valve to Overboard Spill at Drains Tank

   A rigid tube in three sections provides a drain from a connection on the cooler rupture valve on the IDG to a connection on the drains tank overboard spill. The tube is secured externally to the engine by clamp assemblies and connected by union nuts.

3. Tubes, Hydraulic Pump to Overboard Spill Connections

   A rigid tube in three sections provides a drain for the seals of the hydraulic pump drives. The tube connects between the hydraulic pump mounting adapters on the right-hand gearbox and to a connection on the manifold elbow of the oil tank vent tube overboard spill.

   The branched front section drain tube connects to drain outlets on the main and standby hydraulic pump mounting adapters. A flanged connection at the main pump adapter is secured, with a gasket interposed, by two bolts and a union nut secures the tube to the standby pump connection. A union bolt secures the tube to the overboard spill connection. Clamp assemblies support the tube on the engine.

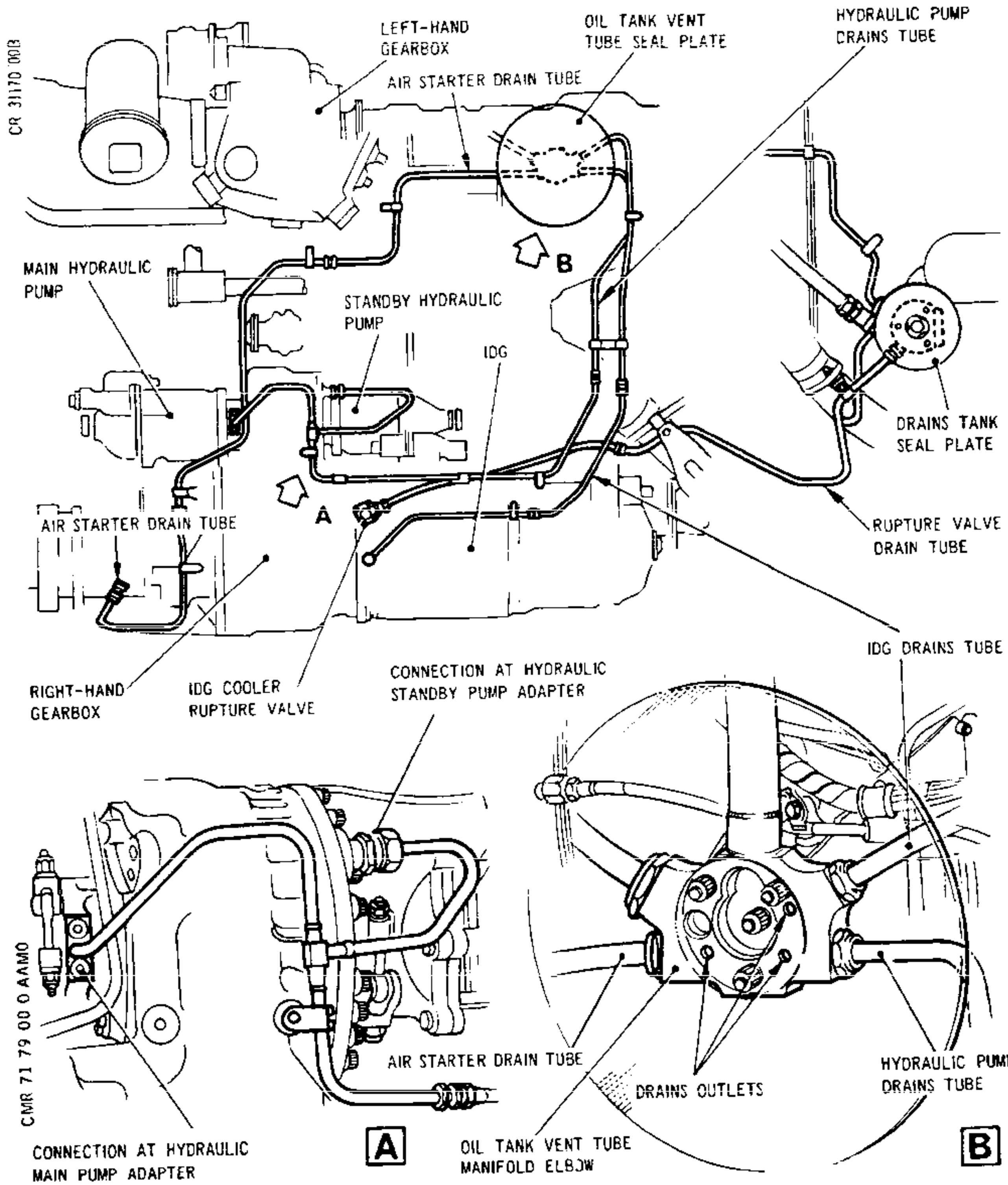
4. Tubes, IDG Seal Drain to Overboard Spill

   A rigid tube in three sections provides a drain from the generator to the oil tank vent tube overboard spill. The tube is secured externally to the engine by a clamp assembly. A union connects the tube at the generator and a union bolt at the overboard spill.

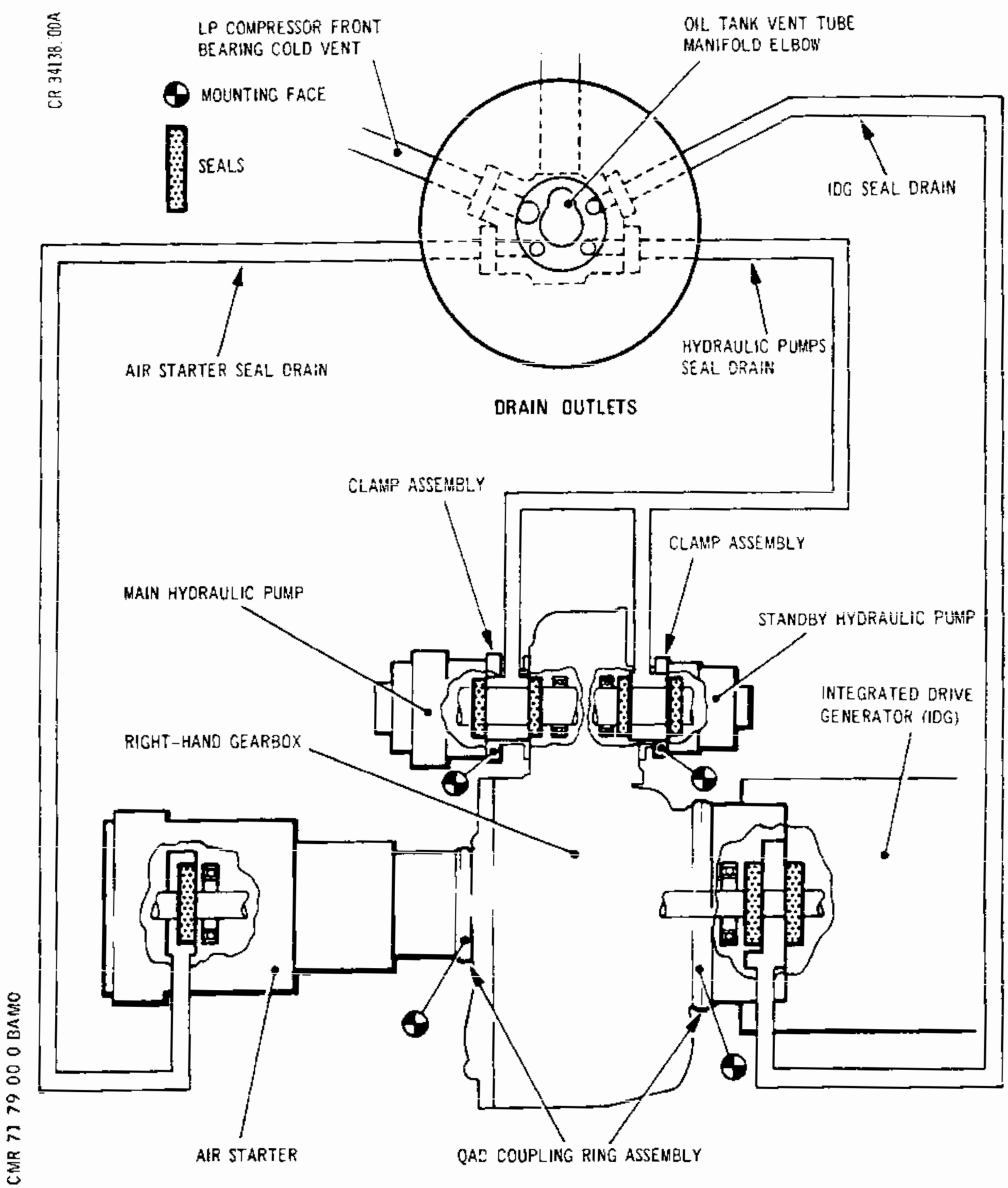
5. Tubes, Air Starter Seal Drain to Overboard Spill

   A rigid tube in four sections provides a drain from the air starter to the oil tank vent tube overboard spill. The tube is secured externally to the engine by clamp assemblies and connected by union nuts.

6. Operation of the IDG Rupture Valve Drain



Oil Drain System
Figure 001



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Oil Drain System Diagrammatic
Figure 002

The IDG oil system includes a section of the fuel cooled oil cooler. Should a rupture of the oil cooler matrix occur, fuel at fuel system pressure would enter the IDG and the cooler rupture valve would act to limit IDG pressurization. The fuel/oil spill relieved by the valve would be dumped via the drain tube to the overboard spill.

7. Operation of Hydraulic Pump Seal Drain

Any hydraulic oil leakage past the seal in the hydraulic pump or engine oil leakage past the pump drive seal in the gearbox will enter a drainage space and pass, via the outlet connection, to the drains system. It then is directed by the drains tube to spill overboard.

8. Operation of IDG Seal Drain

A drainage space is formed between two shaft seals incorporated in the IDG case. The seals separate the engine oil system from the IDG oil system. Leakage from either seal will enter the drainage space and pass, via the outlet connection, to the drains system and the overboard spill.

9. Operation of Air Starter Seal Drain

The shaft seal is located in the air starter at the turbine end of the shaft. Engine oil supply from the engine gearbox entering the starter is retained by the seal and any leakage passes, via a duct, to the outlet connection. The drains system conveys any leakage to the overboard spill.

TUBES - IDG ELBOW TO OVERBOARD SPILL AT DRAINS TANK - REMOVAL/INSTALLATION

1. General

The tubes are in two sections with union connections and may be removed separately; the removal and installation procedures are similar.

2. Tubes

A. Prepare to Remove a Tube Section.

(1) Open engine bay front lower doors (Ref.71-00-00, Servicing).

B. Remove Tube (Ref. Fig. 401).

(1) Unscrew union nuts of section to be removed.

(2) Detach associated supporting clamp assemblies, one on front section and three on rear section, and remove tube section from engine.

(3) If tube section is to be renewed, transfer each clamp assembly to a similar position on the new tube.

C. Install Tube (Ref. Fig. 401).

(1) Apply lubricant A (Ref. 70-00-01, Servicing and Storage Materials) to union connections.

(2) Apply lubricant B to clamp assembly attachment items.

(3) Position tube on engine and secure union connections hand-tight.

(4) Attach and secure clamp assembly bolt and nut torque-tightened to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

(5) Torque-tighten union nuts to between 280 and 310 lbf in. (32 and 35 N.m). Wire-lock union nuts.

D. Complete the Installation.

(1) Close engine bay front lower doors (Ref. 71-00-00, Servicing).

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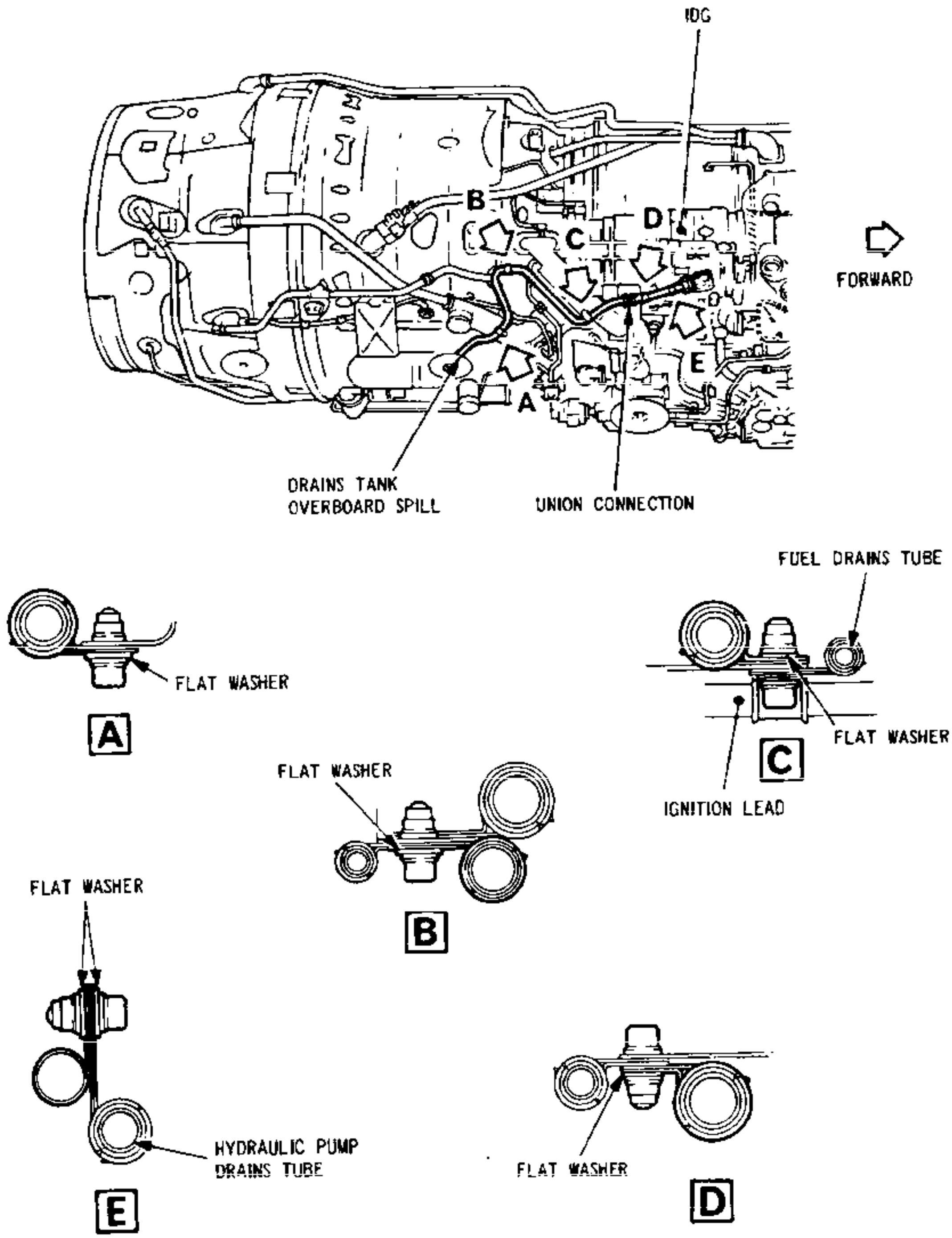


CMR 71 79 01 4 AAMO

Tube Sections and Location Details
Figure 401

TUBES - HYDRAULIC PUMPS TO OVERBOARD SPILL CONNECTION - REMOVAL/INSTALLATION

1. General

The tubes are in three sections, union connected and are removed separately. Details of clamp assemblies are shown in the illustration (Ref. Fig. 401)

Details of lubricants are given in 70-00-01, Servicing and Storage Materials.

R The following procedures apply to both pre and S.B.OL.593-
R 72-115 standard engines.

2. Tube - Hydraulic Pumps to Tube Joint (Ref. Fig. 401)

A. Prepare to Remove Tube.

(1) Open engine bay front lower door (Ref.71-00-00, Servicing).

B. Remove Tube.

(1) Detach supporting clamp assembly.

(2) Remove bolts securing tube flange to main hydraulic pump adapter.

(3) Unscrew union nuts at stand-by hydraulic pump adapter and tube joint connections.

(4) Remove tube from engine and, on SB79-3 standard engines, remove the gasket from the flange on the main hydraulic pump adapter.

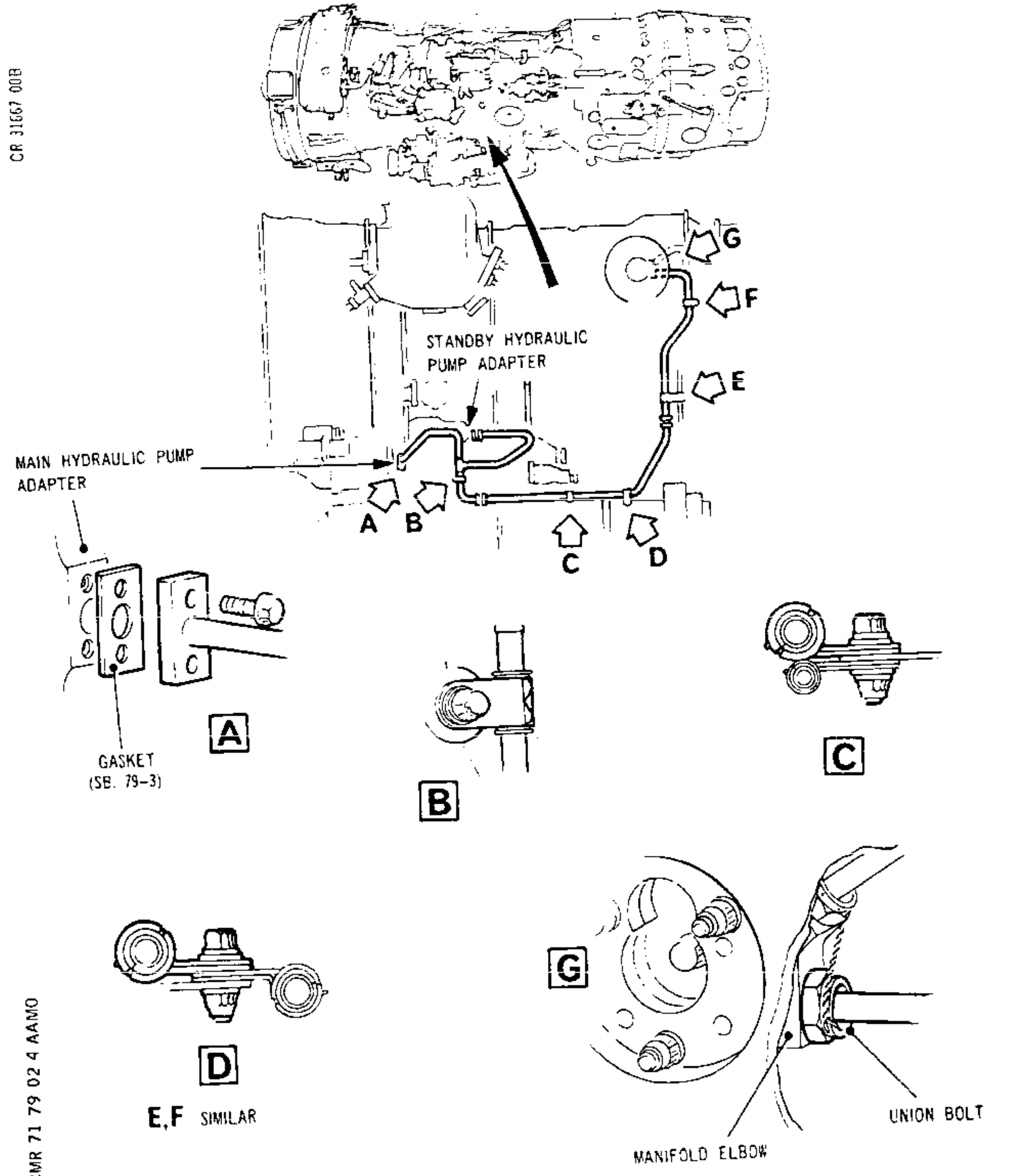
(5) If tube is to be renewed, transfer clamp assembly to similar position on tube to be installed.

C. Install Tube.

(1) Apply lubricant B to flange attachment bolts and clamp assembly items and lubricant A to union connections.

(2) Position tube on engine. Attach tube flange, together with a new gasket, to main hydraulic pump adapter with two bolts lightly tightened.

(3) Engage and lightly tighten union nuts at standby hydraulic pump adapter and tube joint.



Tube Sections and Location Details
Figure 401

R

(4) Attach and secure clamp assembly to right-hand gearbox boss with bolt and flat washer.

(5) Torque-tighten tube flange and clamp bolts to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

(6) Torque-tighten union nuts to between 190 and 210 lbf in. (21,5 and 23,5 N.m). Wire-lock nuts.

D. Complete the Installation.

(1) Close engine bay front lower door (Ref.71-00-00, Servicing).

3. <u>Tube - Centre Section</u>

A. Prepare to Remove Tube.

(1) Open engine bay front lower door (Ref.71-00-00, Servicing).

B. Remove Tube.

(1) Detach supporting clamp assemblies.

(2) Unscrew union nuts and remove tube from engine.

(3) If tube is to be renewed, transfer clamp assemblies to similar positions on tube to be installed.

C. Install Tube.

(1) Apply lubricant A to union connections and lubricant B to clamp assembly items.

(2) Position tube on engine, engage union connections hand-tight.

(3) Attach and secure clamp assemblies to IDG mounted bracket and AC generator flange bracket with bolt, flat washer and nut.

(4) Torque-tighten clamp assembly bolts and nuts to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

(5) Torque-tighten union nuts to between 190 and 210 lbf in. (21,5 and 23,5 N.m). Wire-lock nuts.

D. Complete the Installation.

(1) Close engine bay front lower door (Ref.71-00-00, Servicing).

4. Tube - Tube Joint to Overboard Spill Connection

A. Prepare to Remove Tube.

(1) Open engine bay front lower door (Ref.71-00-00, Servicing).

B. Remove Tube.

(1) Detach supporting clamp assemblies.

(2) Unscrew union nut at tube joint and union bolt at manifold elbow. Remove tube from engine.

C. Install Tube.

(1) Apply lubricant A to union connections and lubricant B to assembly items.

(2) Position tube on engine and engage union connections hand-tight.

(3) Attach and secure clamp assembly to electrical harness support tray with bolt, flat washer and nut.

(4) Attach and secure clamp assembly together with AC generator overboard spill tube clamp assembly to bracket with bolt, flat washer and nut.

(5) Torque-tighten clamp assembly bolts and nuts to between 85 and 95 lbf in. (9,6 and 10,7 N.m).

(6) Torque-tighten union nut at tube joint and union bolt at manifold elbow to between 190 and 210 lbf in. (21,5 and 23,5 N.m). Wire-lock union connections.

D. Complete the Installation.

(1) Close engine bay front lower door (Ref.71-00-00, Servicing).

IDG DRAIN PIPES - REMOVAL/INSTALLATION

1. General (Ref. Fig. 401)

This topic covers the removal and installation of the IDG, drain pipes not covered in the preceding references 71-79-00 and 01. These are the first section of pipes from the IDG cooler rupture elbow to the engine drains tank overboard spill and the last two sections of pipe from the IDG seal drain to the engine oil tank overboard vent.

2. IDG Drain Pipes

A. Prepare to Remove

(1) Open the engine bay front lower door (Ref. 71-00-00, Servicing).

B. Remove IDG Rupture Valve Drain Pipe

(1) Disconnect the P-clips securing the pipe to the hydraulic pump seal drain pipe.

(2) Disconnect the pipe from the IDG cooler rupture elbow, and the engine overboard drains connection, and remove the pipe.

(3) Fit suitable blank covers to the open pipe ends and to the associated apertures.

C. Remove IDG Seal Drain Pipes

(1) Disconnect the P-clips, securing the IDG seal drain pipes to the hydraulic pump seal drain pipes.

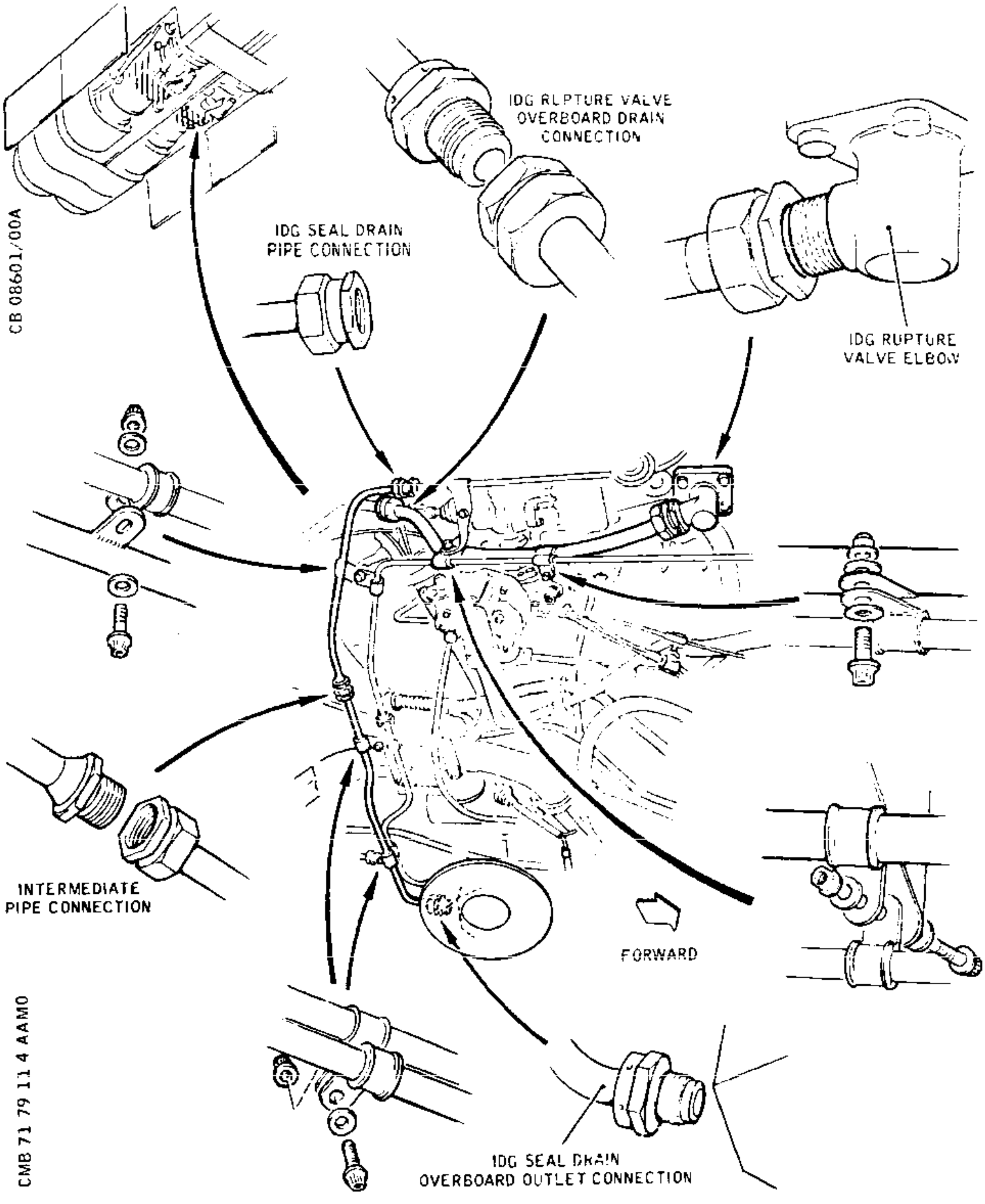
(2) Disconnect the IDG seal drain pipe at the IDG end, and the overboard outlet end, and remove the pipes.

(3) Fit suitable blank covers to the open pipe ends and to the associated apertures.

D. Install IDG Rupture Valve Drain Pipe

(1) Remove the blank covers and ensure that the pipe bore is unobstructed. Connect the pipe to the IDG cooler rupture valve elbow, and the engine overboard drains connection.

(2) Re-assemble the P-clips securing the pipe to the hydraulic pumps seal drain pipe.



IDG Drain Pipes - Installation
Figure 401

(3) Torque load the pipe unions to 200-220 lbf in (2.26 - 2.48 mdaN).

(4) Torque load the P-clip bolts and nuts to 100-120 lbf in (1.13-1.35 mdaN).

E. Install IDG Seal Drain Pipes.

(1) Remove the blank covers and ensure that the pipe bore is unobstructed. Connect the drain pipes at the IDG end, and the overboard outlet end.

(2) Re-assemble the P-clips securing the IDG seal drain pipes to the hydraulic pumps seal drain pipes.

(3) Torque load the pipe unions to 140-160 lbf in (1.58-1.81 mdaN).

(4) Torque load the P-clip bolts and units to 100-120 lbf in (1.13-1.35 mdaN).

F. Conclusion

(1) Close the engine bay front lower door (Ref.71-00-00, Servicing).

END OF THIS SECTION

NEXT